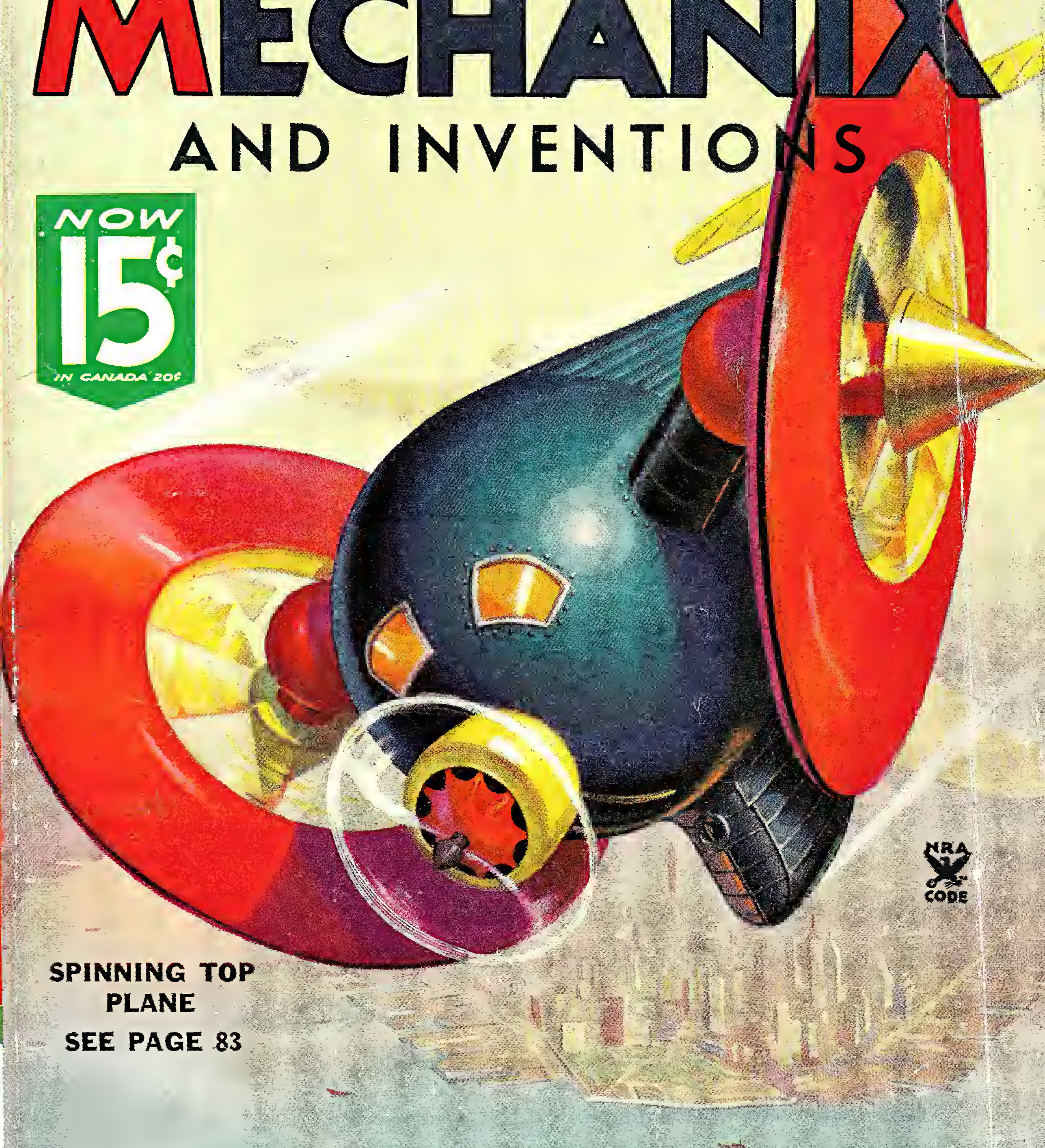
MAY 1935 MODERN MECHANIX and INVENTIONS 15 CENTS

MODERN MECHANIX AND INVENTIONS

May

NOW 15¢ IN CANADA 20¢



SPINNING TOP PLANE
SEE PAGE 83

NRA CODE

Charles F. Kettering of General Motors Seeks

Secret of Hidden Power in Grass

NEW PORTRAIT RING CRAZE

BRINGS Amazing Profits to Salesmen

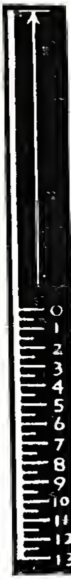
Brand new—entirely different—a smashing hit—an amazing money-maker. Orders are rolling in from all over the country. Salespeople are wildly enthusiastic. Orders in bunches of 5, 10, 15 come in every mail. Scores say, in effect, they've never sold anything that got an order so quickly. No long, complicated demonstration. No high-pressure selling. No long-winded sales talk. No arguments. Just show the ring, say a few words, and everyone gets the idea instantly.

People are astonishingly hungry for the Portrait Ring—they buy it on sight—because it satisfies an intense human longing that is concealed in the heart of every person young and old. Never in the history of direct selling has there been such a profit-making sensation. No wonder salesmen everywhere are going wild over it and reporting phenomenal earnings from this sensational new discovery. It just can't help but make money for you.

Photo returned unharmed with ring.

Any Size PHOTO or SNAPSHOT Made Into Life-Time Remembrance Ring

Through a newly developed, exclusive and secret process any size photo or snapshot of loved one is reproduced on a beautiful onyx-like black life-time remembrance ring. Reproduction clear and sharp. Unbreakable. Should last a life-time. Not affected by heat, water or tarnish. Never fades. Light in weight. Each ring individually made. Shipped in beautiful gift box. Picture returned with ring.



Pocket Big Advance Cash Profits By Wearing Sample Ring on Finger

No bulky sample case to lug around. No money tied up in a stock of merchandise. No goods of any kind to handle. You don't have to make deliveries. Just wear this magic Portrait Ring on your finger. That's all the equipment you need besides a big supply of order blanks. And you collect your cash in advance—long before I get mine. You merely show ring on your finger, write up order, and collect your profit immediately. Then send order to me and I take care of everything else.

Sells at Fraction of the Price of an Ordinary Ring

You sell this amazing Portrait Ring at a price so low it seems almost unbelievable. Probably you'd guess its price at $5.00 to $10.00 or more. But this ring sells for the unheard of low price of ONLY $1.95 and it contains the most treasured setting any ring could have—a picture of some loved one. And here's the best news of all. Our amazing new plan enables producers to earn $11.25 or more per dozen rings sold.

SEND NO MONEY-JUST MAIL COUPON AND YOUR RING SIZE

PORTRAIT RING CO.,
Dept. 16-E, 12th & Jackson Sts.,
Cincinnati, Ohio

Enclosed is photo. My ring size is ——. Please rush individually made Portrait Ring with my photo on it, also complete starting equipment. Will pay postman $1.00 plus few cents postage. It is understood that if I am not entirely satisfied I can return ring within 5 days after receipt and you will refund my money in full.

(Photo must be one person only. Groups or 2 or 3 heads cannot be reproduced on one ring.)

Name ....

Address ....

City or Town.......................................State ....

Cash In NOW!

The immense flood of orders already received and pouring in daily will scarcely scratch the surface of the vast market of more than 100 million prospects in the United States. Never in your lifetime have you had such a profit opportunity staring you square in the face. It's positively awe-inspiring, overwhelming, unmatched in all history.

I Am Ready to Send Sample Portrait Ring to You

Rush snapshot or photo of loved one with ring size for special 5-day no-risk sample offer. Pay postman only $1.00 plus few cents postage when ring is delivered. If not entirely satisfied, return ring in five days and I'll return every penny you paid me. To find your ring size wrap narrow strip of paper around finger and trim so ends meet. Then lay the paper on the "Ring Measurement Chart" at left. Reading from top of arrow down the chart, the number at end of paper is your size. Then fill in coupon with your ring size, name and address. **Send no money—just coupon and photo.**

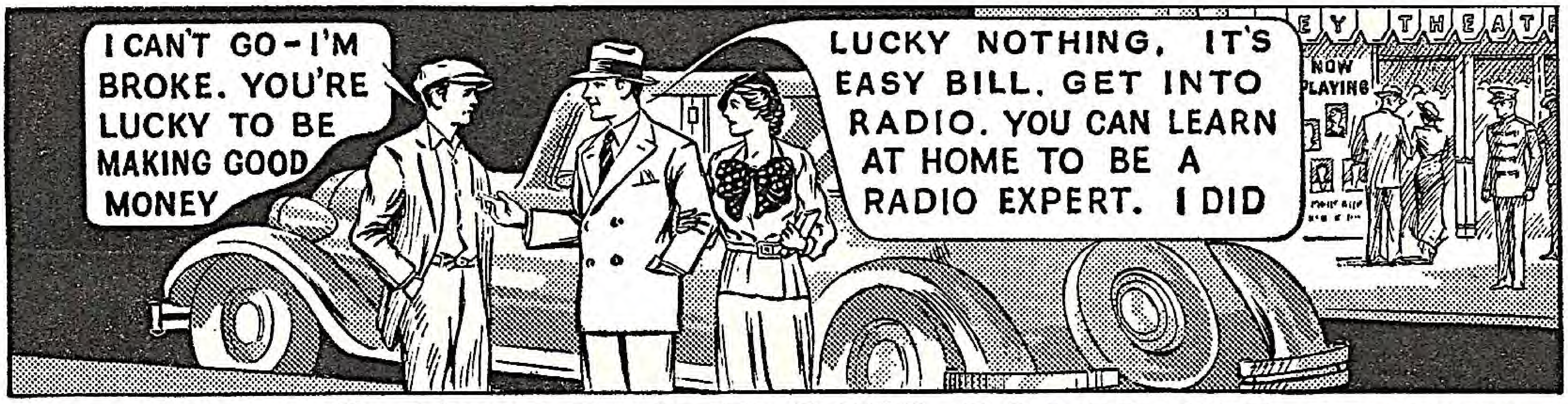
Your Supreme Opportunity to Reap Record-Breaking Profits

The Portrait Ring "craze" will grow like wildfire in your town. Eager buyers will literally beg you to accept their orders for Portrait Rings. You'll take the entire community by storm. People who buy Portrait Rings will be walking advertisements for you. Friends, neighbors, relatives, acquaintances will see this novel ring and ask them where it was bought. They will admire it so much they won't have a minute's rest until they give you their orders. The more you sell the bigger your demand will grow.

You Don't Risk a Cent

I take all the chances. For any reason at all you can return ring within 5 days and get back every penny of the money you paid me for it. I am the only one who can lose. Rush coupon today. Order blanks and complete instructions for cashing in on this money-making sensation sent FREE. Act now. Mail the coupon at once. Remember—you pay nothing until postman delivers your personal ring—then only $1.00 plus few cents postage for the regular $1.95 Portrait Ring.

PORTRAIT RING COMPANY
Dept. 16-E
12th and Jackson Sts., Cincinnati, Ohio

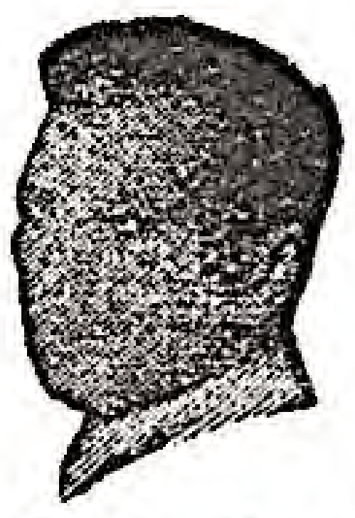

I CAN'T GO - I'M BROKE. YOU'RE LUCKY TO BE MAKING GOOD MONEY
LUCKY NOTHING, IT'S EASY BILL. GET INTO RADIO. YOU CAN LEARN AT HOME TO BE A RADIO EXPERT. I DID
NOW PLAYING

I WILL TRAIN YOU AT HOME IN SPARE TIME FOR A GOOD RADIO JOB!

J. E. SMITH, Pres., National Radio Institute

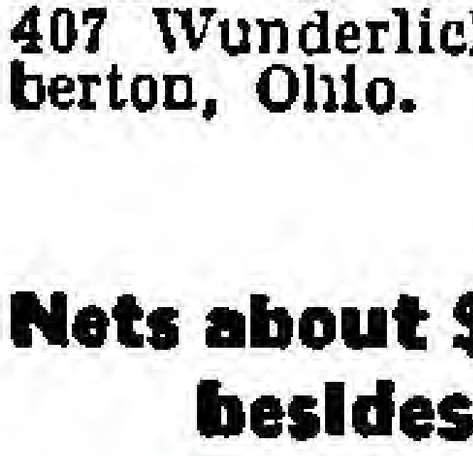
HERE'S PROOF

$18 a Week in Spare Time



"Although I am doing only spare time Radio work, I have averaged $18 a week. I recommend N. R.I. training. It is certainly a complete Course. In a short time it will take a man, give him a sound fundamental training in Radio theory, practice, and design." STEPHEN J. DRAPCHATY, 407 Wunderlich Ave., Barberton, Ohio.

Nets about $50 a Week besides Sales



"I have been getting along fine. I average ten calls a week, which nets me about $50, not counting profits on sales. I have serviced almost every make of set and have earned more than I ever expected. I owe my success to the N.R.I. and its wonderful Course." BERNARD COSTA, 150 Franklin St., Brooklyn, New York.

Why slave your life away in a no-future job? Why skimp, why scrape trying to pay your bills? I'll train you quickly for a field with a future—RADIO. $40, $60, $75 a week—that's what many Radio Experts make. $5, $10, $15 a week extra is what many make in spare time while learning. My free book tells you about Radio's spare time and full time opportunities—about my tested training—about my students and graduates—what they are doing and making. Get this free book.

Many Radio Experts make $40, $60, $75 a Week

I'll train you quickly and inexpensively right in your own home and in your spare time. My practical 50-50 method of training makes learning at home easy, fascinating, practical and rapid. Many of my successful graduates didn't even finish grade school.

Many make $5, $10, $15 a week in Spare Time while learning

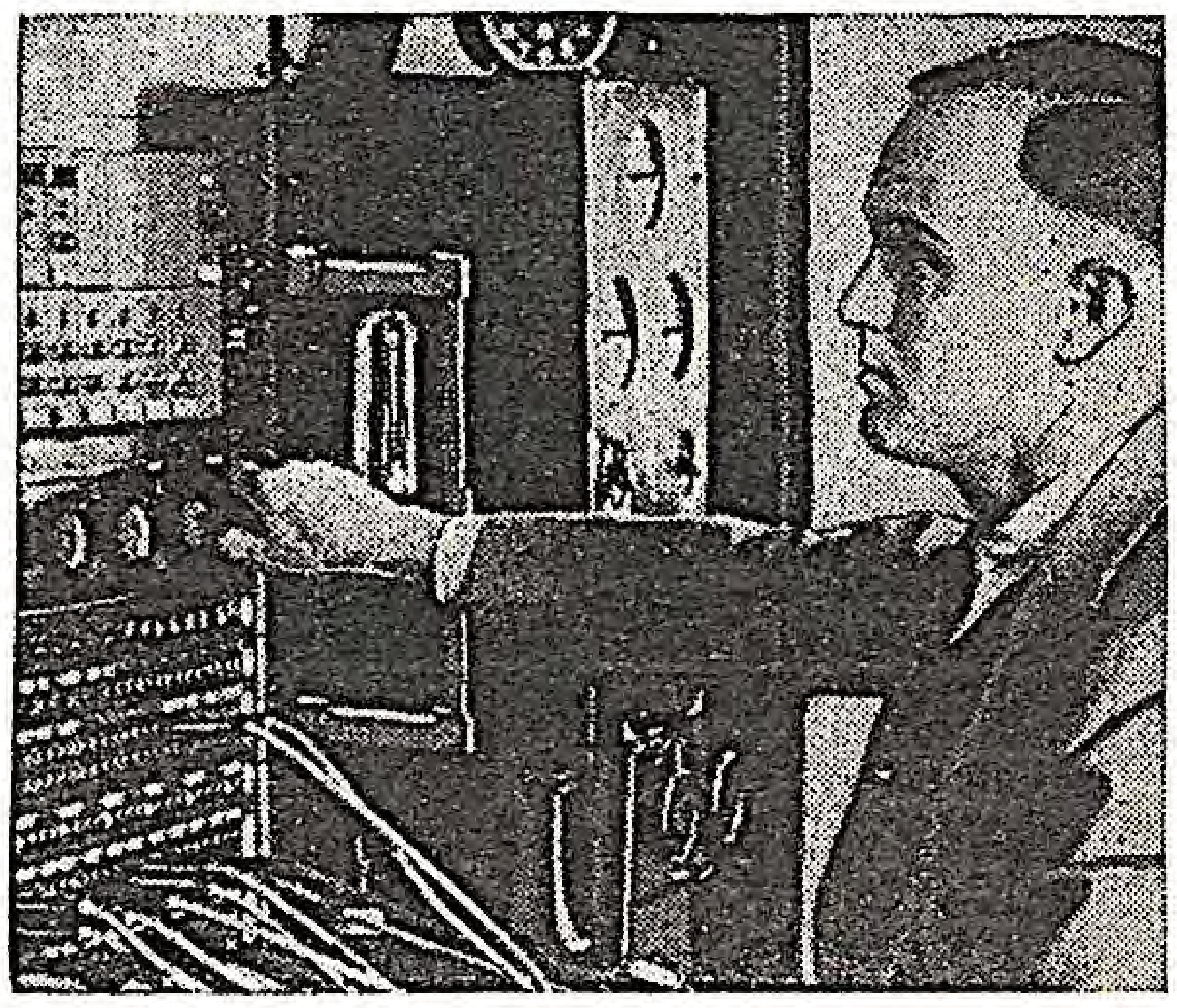
My Training is famous as "the Course that pays for itself". The day you enroll I start sending you Extra Money Job Sheets which quickly show you how to do Radio repair jobs common in most every neighborhood. Julian B. Hall, Fort McPherson, Ga., estimates $412 for nine months' spare time earnings while learning. J. R. Ritz, 3525 Chapline St., Wheeling, W. Va., writes: "While taking your Course, my spare time earnings netted more than $1,000 a year."

Find out what Radio Offers You

Act today. Mail the coupon. Any ambitious fellow over 15 can get a free copy of my book. It tells about Radio's opportunities—about my Money Back Agreement—shows you what graduates are doing and making. No obligation. Mail the coupon now.

J. E. SMITH, President
National Radio Institute, Dept. 5EH
Washington, D. C.

The Tested Way to BETTER PAY



I'll Train You For Jobs Like These

Spare time and full time Radio Servicing, Installing, operating, servicing Broadcast, Aviation Radio, Commercial, Ship and Television stations, or a Radio service business of your own. I'll train you for these and other good jobs in the manufacture, sale and service of Radio, Loud Speaker, and Television apparatus. My FREE book tells you about the many money-making opportunities in Radio. Wm. Spartivent, 93 Broadway, Newark, N. J., made $6,000 in 2 depression years. Noel W. Ray, 619 Broad Street, Gadsden, Ala., made $4,500 in 18 months.

MAIL THIS NOW!

J. E. Smith, President
National Radio Institute, Dept. 5EH
Washington, D. C.

Dear Mr. Smith: Without obligating me, send free book about spare time and full time Radio opportunities, and how I can train for them at home in spare time. (Please Print Plainly.)

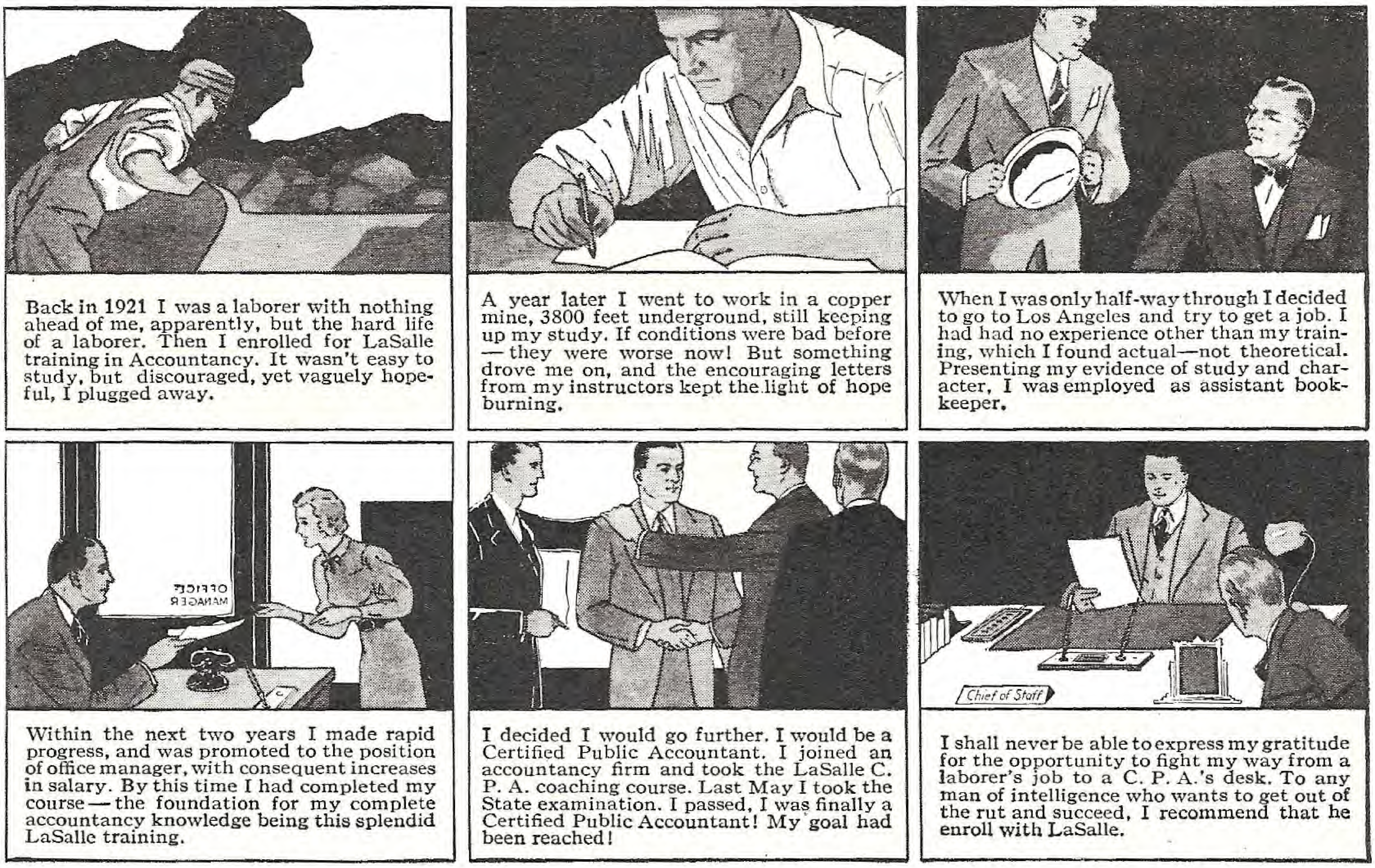
Name.................................... Age........

Address ....

City.................................... State........

He Climbed—*Out of a Mine Shaft Into a Chief Executive's Chair!*

THE AMAZING STORY OF A LaSALLE STUDENT*



Back in 1921 I was a laborer with nothing ahead of me, apparently, but the hard life of a laborer. Then I enrolled for LaSalle training in Accountancy. It wasn't easy to study, but discouraged, yet vaguely hopeful, I plugged away.

A year later I went to work in a copper mine, 3800 feet underground, still keeping up my study. If conditions were bad before — they were worse now! But something drove me on, and the encouraging letters from my instructors kept the light of hope burning.

When I was only half-way through I decided to go to Los Angeles and try to get a job. I had had no experience other than my training, which I found actual—not theoretical. Presenting my evidence of study and character, I was employed as assistant bookkeeper.

Within the next two years I made rapid progress, and was promoted to the position of office manager, with consequent increases in salary. By this time I had completed my course — the foundation for my complete accountancy knowledge being this splendid LaSalle training.

I decided I would go further. I would be a Certified Public Accountant. I joined an accountancy firm and took the LaSalle C. P. A. coaching course. Last May I took the State examination. I passed, I was finally a Certified Public Accountant! My goal had been reached!

I shall never be able to express my gratitude for the opportunity to fight my way from a laborer's job to a C. P. A.'s desk. To any man of intelligence who wants to get out of the rut and succeed, I recommend that he enroll with LaSalle.

Spare-Time Training Promises Great Rewards Today

THIS true story illustrates what a man can do, who is resolved to get out of a rut and is willing to invest his spare time now for the sake of tremendous dividends later.

Why not take unbiased stock of *your* capabilities? Have *you* the training and knowledge needed to carry you from your present job to a highly-paid future position? If not, you must first equip yourself—to meet fast-changing business conditions that are today rich with opportunity for advancement, greater security and increased income. Not until you can do some one particular thing and do it *well*, are these prizes for YOU.

LaSalle experts will show you how to get this vital preparation, quickly, completely. Step by step down the road to advancement, they will guide you. Simply check on this coupon the field in which you are interested, and we will send you FREE a valuable booklet telling of the opportunities for financial independence that await the man who is *trained*.

By all means learn these facts that have helped hundreds to pull themselves out of the rut of small jobs with little pay, up to posts of responsibility and large earnings. Back your purpose with your pencil, check the field that appeals to you, and mail the coupon now.

*Name gladly given on request.

La Salle Extension University, Dept. 5493-R, Chicago.

Kindly send me your free booklet on the business field I have checked—and tell me how your training in that field can help me.

☐ **Business Management**
☐ **Law**
☐ **Traffic Management**
☐ **Business Correspondence**
☐ **Commercial Law**
☐ **Accountancy**
☐ **Salesmanship**
☐ **Business English**
☐ **Bookkeeping**

Name.. *Position*....................

Address ....

LaSALLE EXTENSION UNIVERSITY

PRICE 15 CENTS
(20 CENTS IN CANADA)

MODERN MECHANIX AND INVENTIONS

MAY
1935

Volume XIV
Number I

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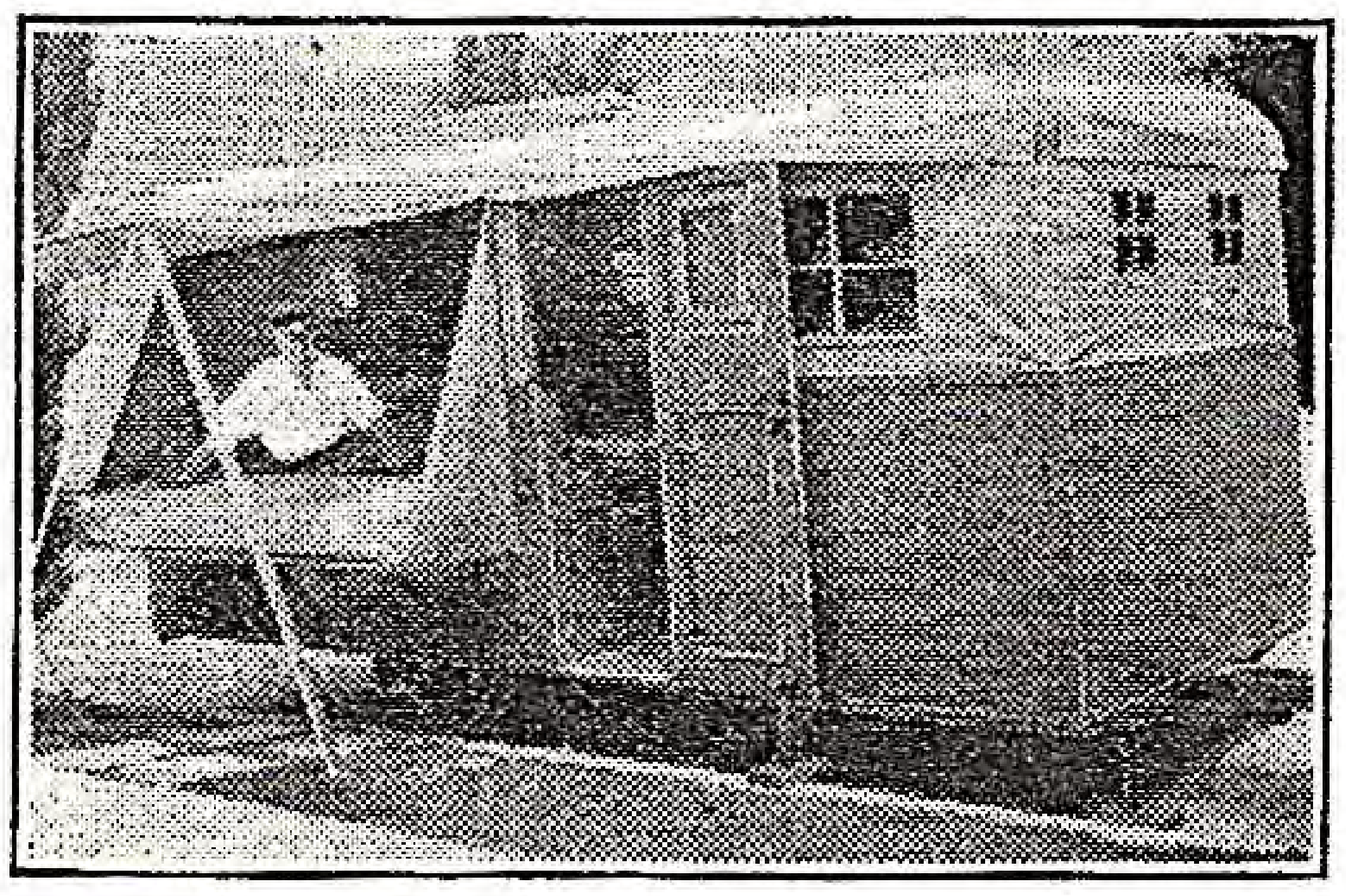
BUILD THIS MOVIE STAR'S TRAILER



Inexpensive, light, easily constructed, this collapsible movie star's trailer will withstand the most severe usage.

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"MAKE IT SNAPPY, DAD-MA'S LOOKING FOR HER CAN OF SANI-FLUSH!"

WHEN you drain your anti-freeze, get hold of a can of Sani-Flush. For a few cents you can clean out the rust and scale that accumulate inside your car radiator. You can insure a clean flow of water to keep the motor cool. Saves repair bills. Insures best performance.

It's a simple job to do yourself. Pour in half a can of Sani-Flush. Run the motor. Drain the radiator. (Directions on the can.) Sani-Flush cannot harm your car.

You'll probably find Sani-Flush in your house. Most women use it to keep toilet bowls clean and sparkling. Sani-Flush is sold by all grocery, drug, and hardware stores — 25c. The Hygienic Products Co., Canton, Ohio.

Sani-Flush 25¢

KEEPS RADIATORS CLEAN

TIRES MADE Puncture Proof as Low as 40¢

Make UP TO $6.85 IN AN HOUR

Quick-Easy
Just Squirt No-Flatz Into Tubes Through Valve Stem

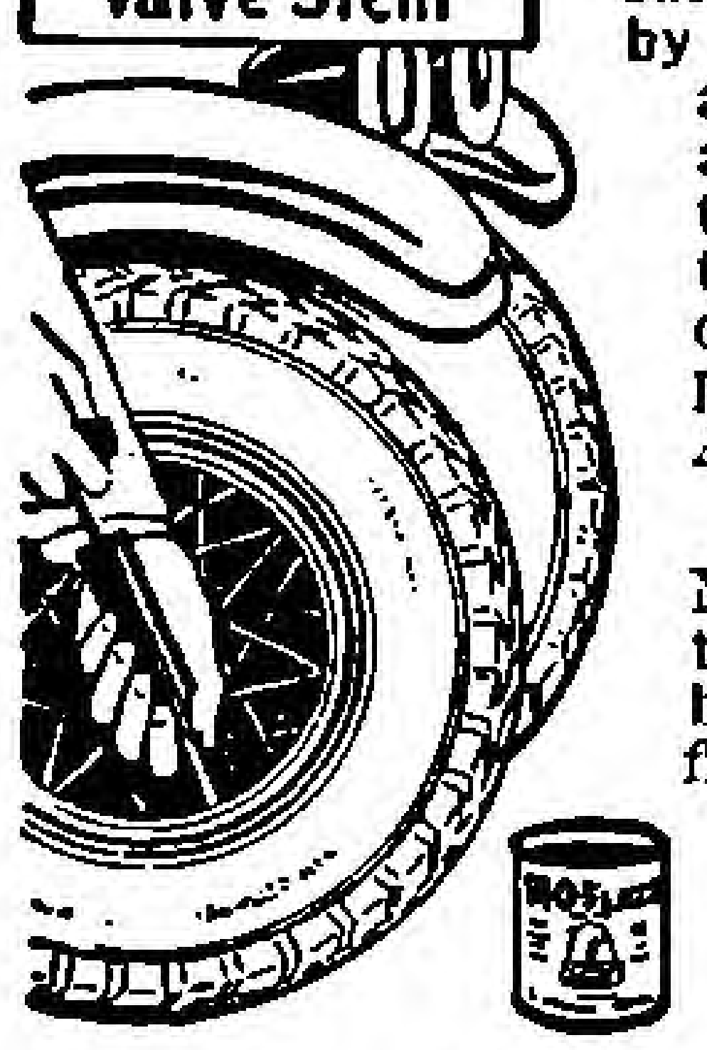
NO-FLATZ—sensational new discovery, ends flat tires forever! Just squirt it into tubes through valve stem and enjoy complete safety at any speed. **No-Flatz seals holes made by nails, tacks, glass, etc., air-tight INSTANTLY and PERMANENTLY**—Increases life of tires and tubes. No more life-endangering punctures! No more ruined, rim-cut casings or torn, ruined tubes. No more puncture fixing cost! Takes only 5 minutes to make all tires puncture proof. Easy! Low priced! GUARANTEED.

FREE SAMPLE

Men! This is a hot one! Auto, fleet, taxi and truck owners eager to buy. Big money for ambitious, live-wire distributors. Get in on ground floor. Write or wire for FREE SAMPLE OFFER and details.

Opportunity for Distributors in Foreign Countries

NO-FLATZ CO. Dept. J-363 CINCINNATI, OHIO



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BE A RADIO EXPERT

LEARN at HOME *from* REAL RADIO ENGINEERS

RAY D. SMITH, Pres. R-T-I

Let these Engineers, RIGHT FROM THE HEART OF THE GREAT RADIO INDUSTRY TRAIN YOU IN SPARE TIME FOR A *Good Pay Job!*

HERE THEY ARE:

Kendall Clough
Chief Engineer,
Clough-Brengle Co.

E. E. Gramer
Chief Engineer,
Standard Transformer Corporation.

Karl E. Hassel
Chief Engineer,
Zenith Radio Corporation.

H. C. Tittle
Chief Radio Engineer,
General Household Utilities (Grunow).

F. D. Whitten
Service Manager,
Chicago Branch, Philco Radio & Television Corp.

Dr. C. M. Blackburn
Radio Engineer,
P.R. Mallory & Company,
Mfrs. of Radio Apparatus.

LearnRadio from these men! Just see who they are! All top-notch engineers—selected by the great Radio concerns they work for to supervise and direct your Training. Learn Radio the way the Radio Industry wants you to learn it—the Shop way—the practical way—the real money-making way.

Only the Radio & Television Institute can offer you this chance to learn Radio from real Radio Engineers working right in the heart of the Radio Industry.

50 *Great Radio Concerns* ENDORSE *this* TRAINING *and* RECOMMEND *it to* YOU

Among them

CROSLEY • PHILCO
STEWART-WARNER
GRUNOW
STROMBERG
ZENITH
and 44 *Others*

Get the entire list in my book. Read what 50 of these big concerns say about R-T-I. See why they recommend this training to their distributors and dealers.

GET INTO THE GOOD PAY FIELD WHERE HUNDREDS OF R-T-I TRAINED MEN EARN

$35 *to* $75 *a week*

Don't waste time on a small-pay, no-future job when hundreds of men are drawing down $35 to $75 every week as R-T-I Trained Experts. Get ready for a real job. Get into Radio now. My big FREE book tells you how you can learn at home to fill good-pay full-time or part-time Radio jobs.

Good-Pay Opportunities, Everywhere

Broadcasting Stations, Factories, Dealers and Distributors and others all use "trained" men, and pay up to $5000 a year. Air Craft and Short Wave Radio, Photo Cells, Public Address Systems and Sound Pictures have created thousands of good-pay jobs. This is a big year for Radio. New developments in receivers alone, - demand up-to-date trained technical men. Get the facts in my free book.

Learn at Home, In Spare Time

Hold your job. Keep down expenses. My famous method of home training—*endorsed by more than 50 leading Radio manufacturers*—gives you simplified, practical training along workshop lines. In a few short months many R-T-I Trained men step out of poor-pay, no-future jobs into big-future Radio work paying $35 to $75 a week and up.

Many Make $5 to $20 A Week Extra In Spare Time, While Learning

C. E. Head, Alexandria, La., wrote: "Made $14.25 in spare time eleven days after enrolling." L. M. Christensen, Deweyville, Utah, wrote: "Got my first spare-time job two weeks after enrolling. Have already made $250 doing spare-time Radio work."

4 Big Working Outfits Included, No Extra Charge

These outfits developed by Engineers directing R-T-I Training to make your Training Real Shop Training for the home. Can be used in your service work.

Money Back If Not Satisfied

To learn Radio the R-T-I way you don't have to be a College man, or even a High School graduate. This Training is simplified and practical. Five advanced Courses given EXTRA. Get my money back agreement. See how I protect you if you are not satisfied.

GET MY FREE BOOK

Let me tell you more about this amazingly easy home-training, and more about the opportunities in Radio for R-T-I TRAINED men. Let me show you how you, too, can make good in the world's fastest growing industry. Everything is fully explained in my big, new book . . . "RADIO'S FUTURE, AND YOURS." Send today for your copy. The book is free.

RAY D. SMITH, President
RADIO & TELEVISION INSTITUTE
CHICAGO

18 YEARS' EXPERIENCE IN TRAINING MEN FOR BETTER JOBS!

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Radio & Television Institute (R-T-I)
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Dear Mr. Smith: Without obligating me, send me your book that explains your Engineer-Directed and Industry-Endorsed method of training men quickly and inexpensively at home in their spare time to be Radio Experts.

Name...

Address....................................Age........

City..........................State....................

BOYS, JUST WAIT 'TILL YOU SEE THE 1935

IVER JOHNSON BICYCLES

THEY TOP THEM ALL IN POPULARITY

from $27.50

They outclass all others in Sparkling Beauty and Ease of Riding. Strength of Construction, Quality of Materials and Expert Workmanship guarantee super-safety.

Iver Johnson quality at Iver Johnson prices is the world's greatest bicycle value.

Balloon or standard tires, and the very latest in equipment.

Send for color folder 64-B for complete details of America's Finest Bicycles.

Shipped direct if no dealer nearby.

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NEW YORK, 85 Chambers St. CHICAGO, 108 W. Lake St.
SAN FRANCISCO, 731 Market St. MONTREAL, Coristine Bldg.

110-VOLT 60 CYCLE A. C. GENERATOR $17

Delivers pure A. G. Ideal for radio, light plants. New 300 Watt, 3,600 R. P. M. Ball bearings completely enclosed. Mounted on special base with automatic spring tension take-up for belt drive, flat or "V". Equipped with 1-2" Diam. shaft extension. Requires 1-2 to 3-4 H. P. Wound for 6-V. D. C. excitation from battery or auto generator. Workmanship and materials guaranteed. Write for details.

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You can now build your own midget front drive auto, for racing or sport use, with the simplest drive, using "T" Ford parts and few tools.

With the plans now available, this 4 wheel brake, front drive, can be built at home, using your motorcycle motor and other car parts.

Made without the extensive machine work found in cars of this type, this "Silver Bullet" can be built by almost anyone and most economically.

Send stamps for further details.

E. A. BORNTRAEGER
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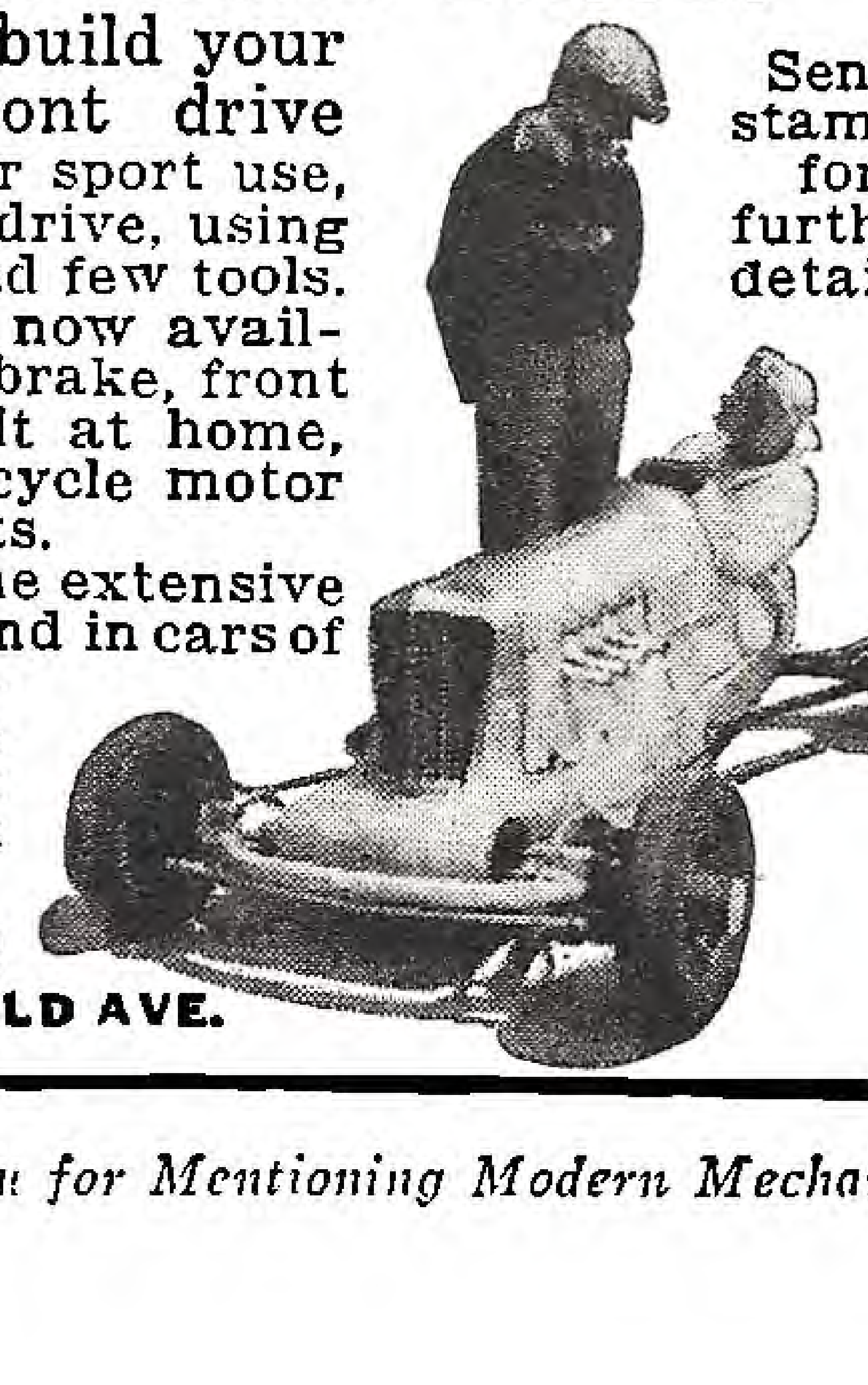
CHICAGO, ILL.



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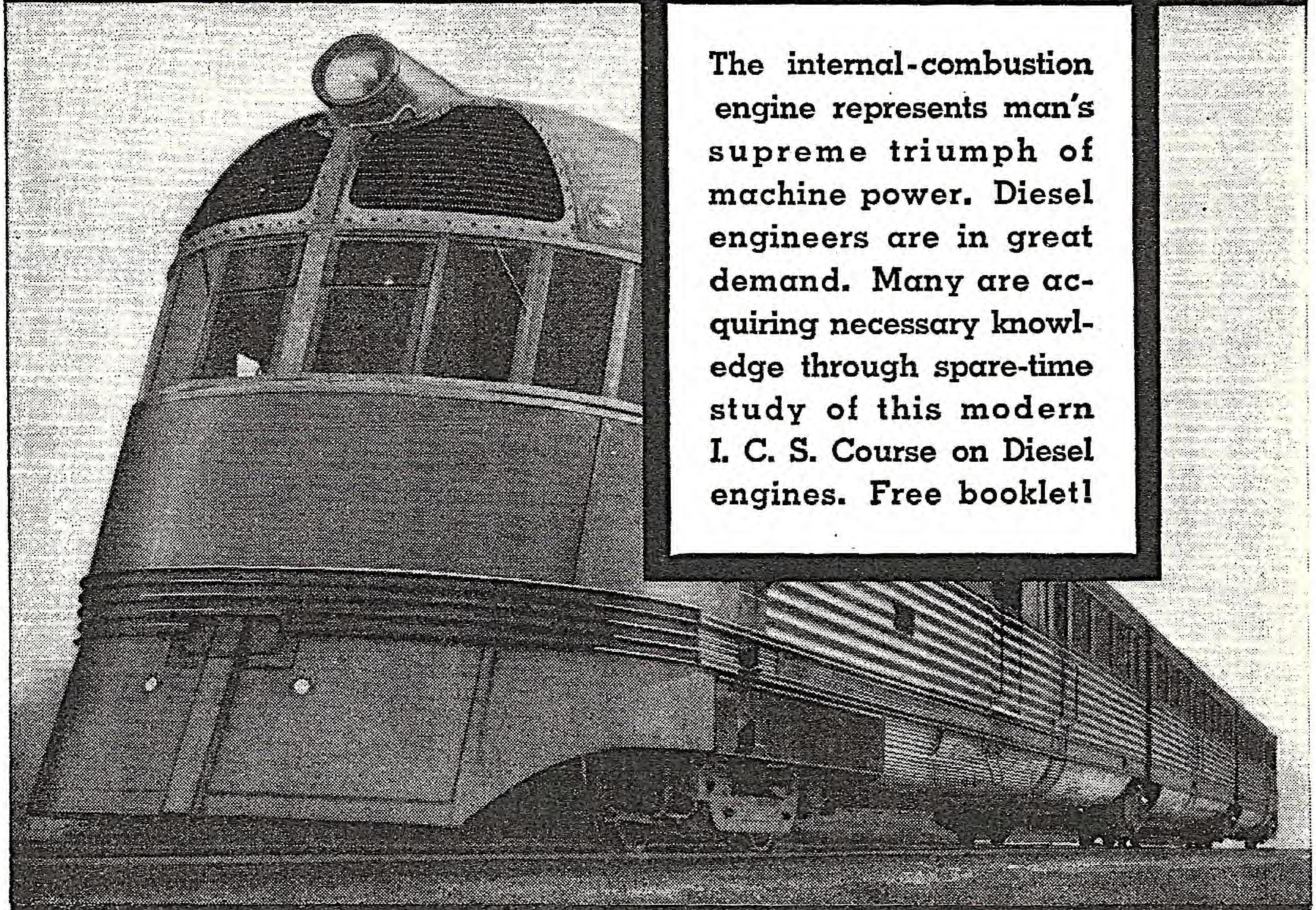

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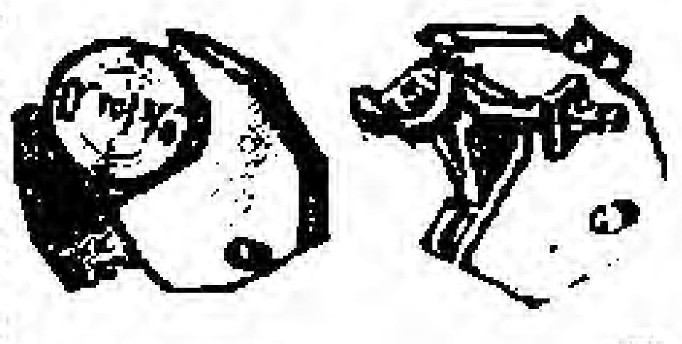

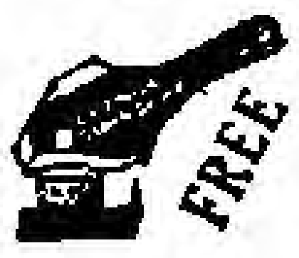

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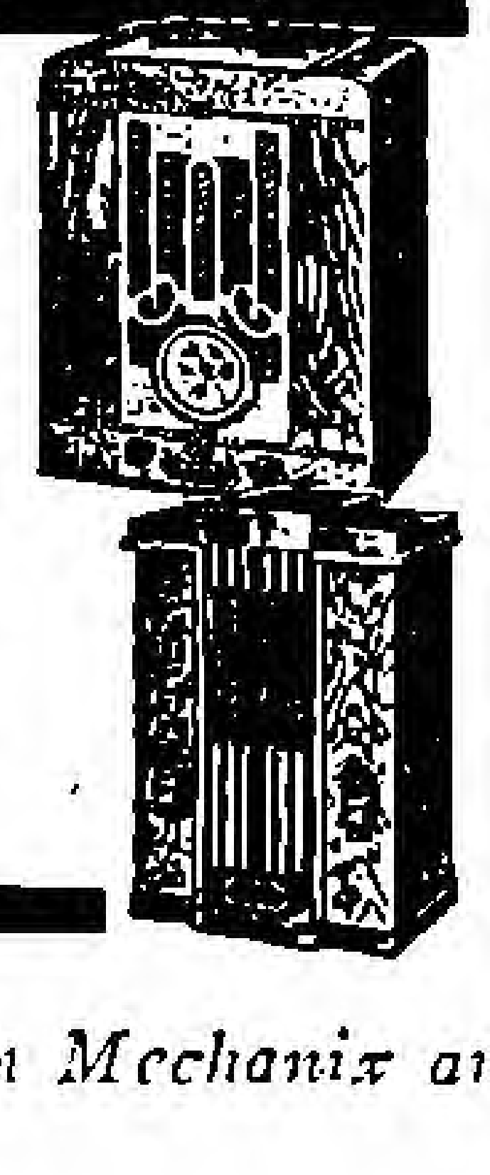

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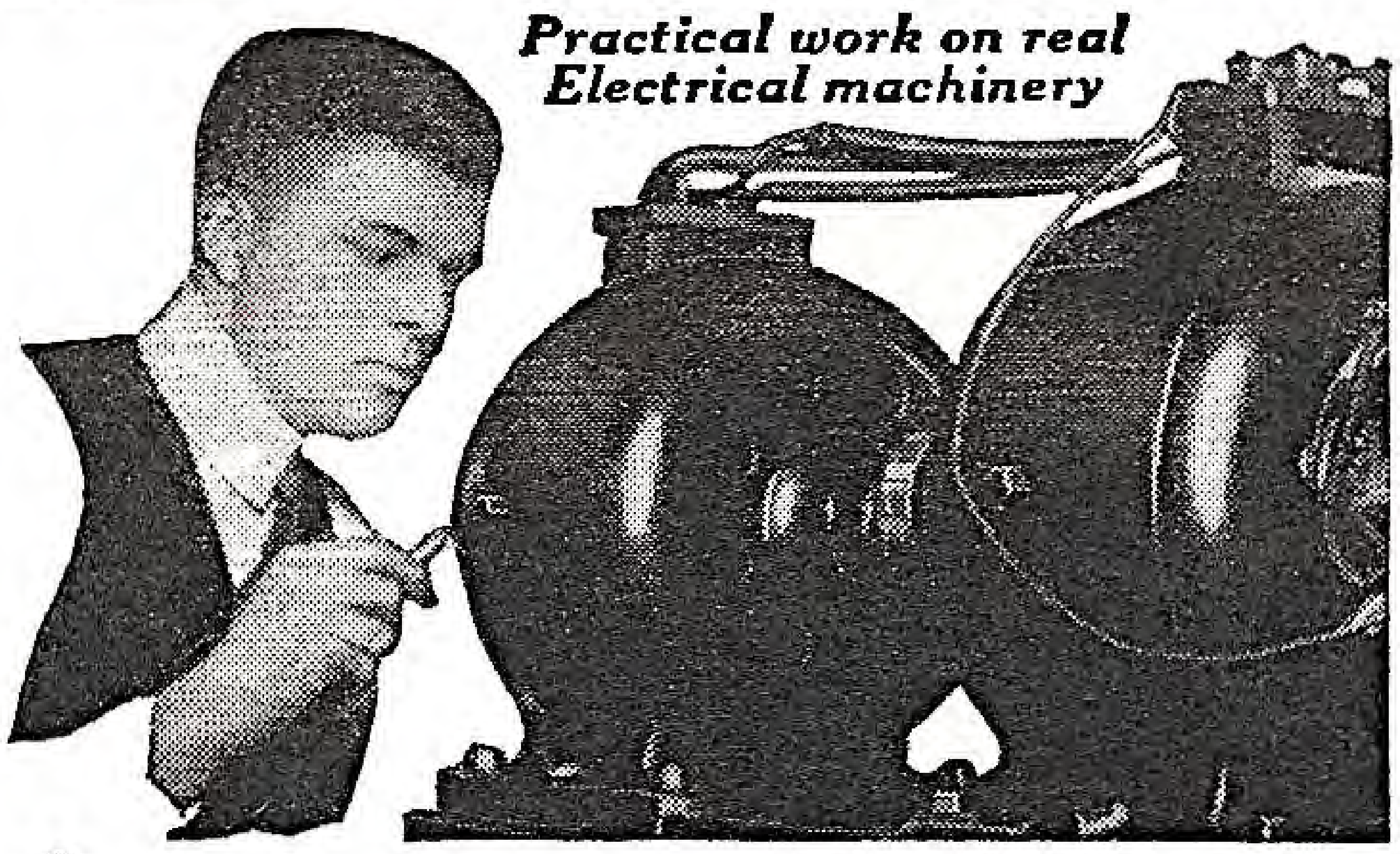

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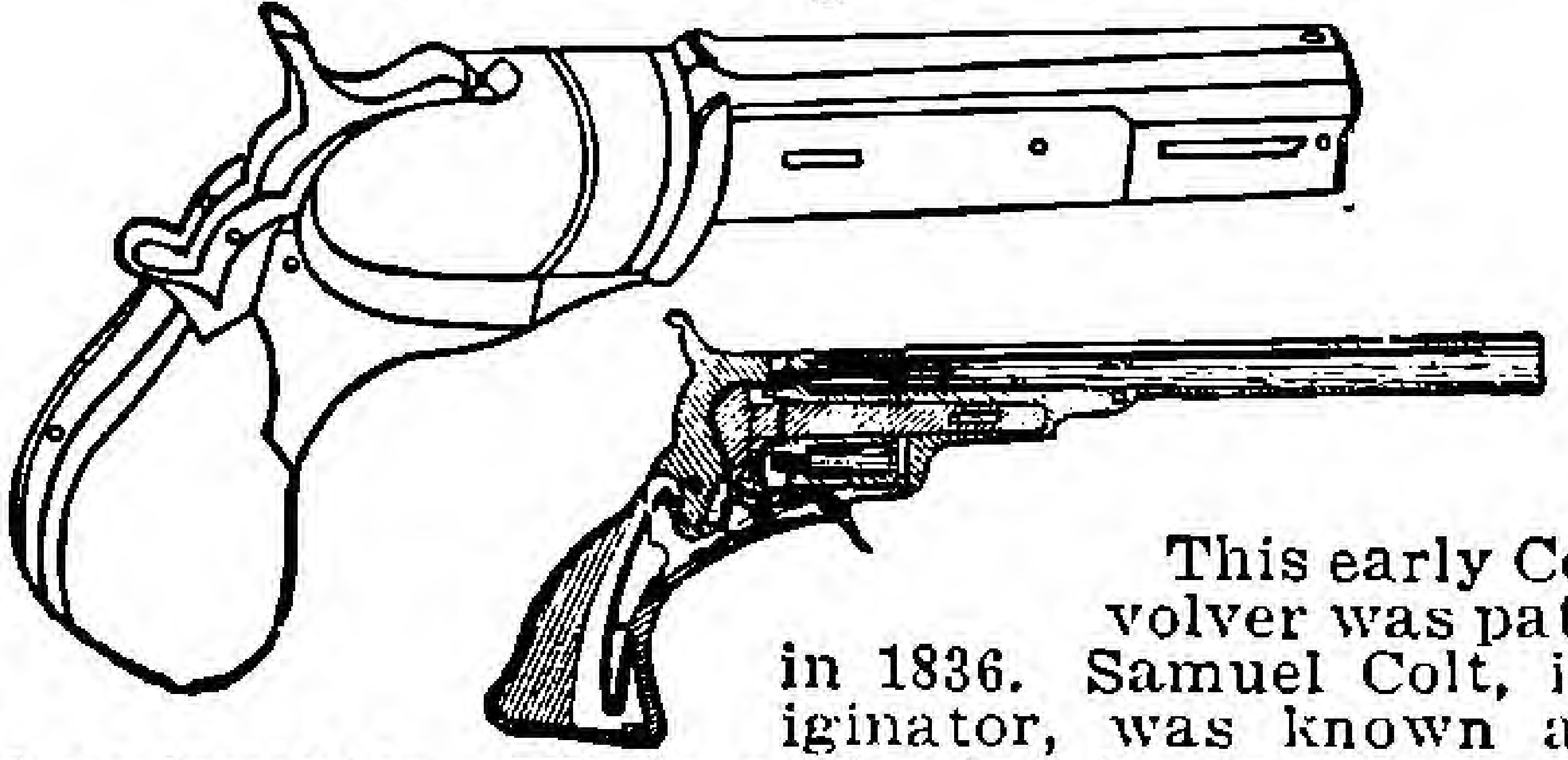

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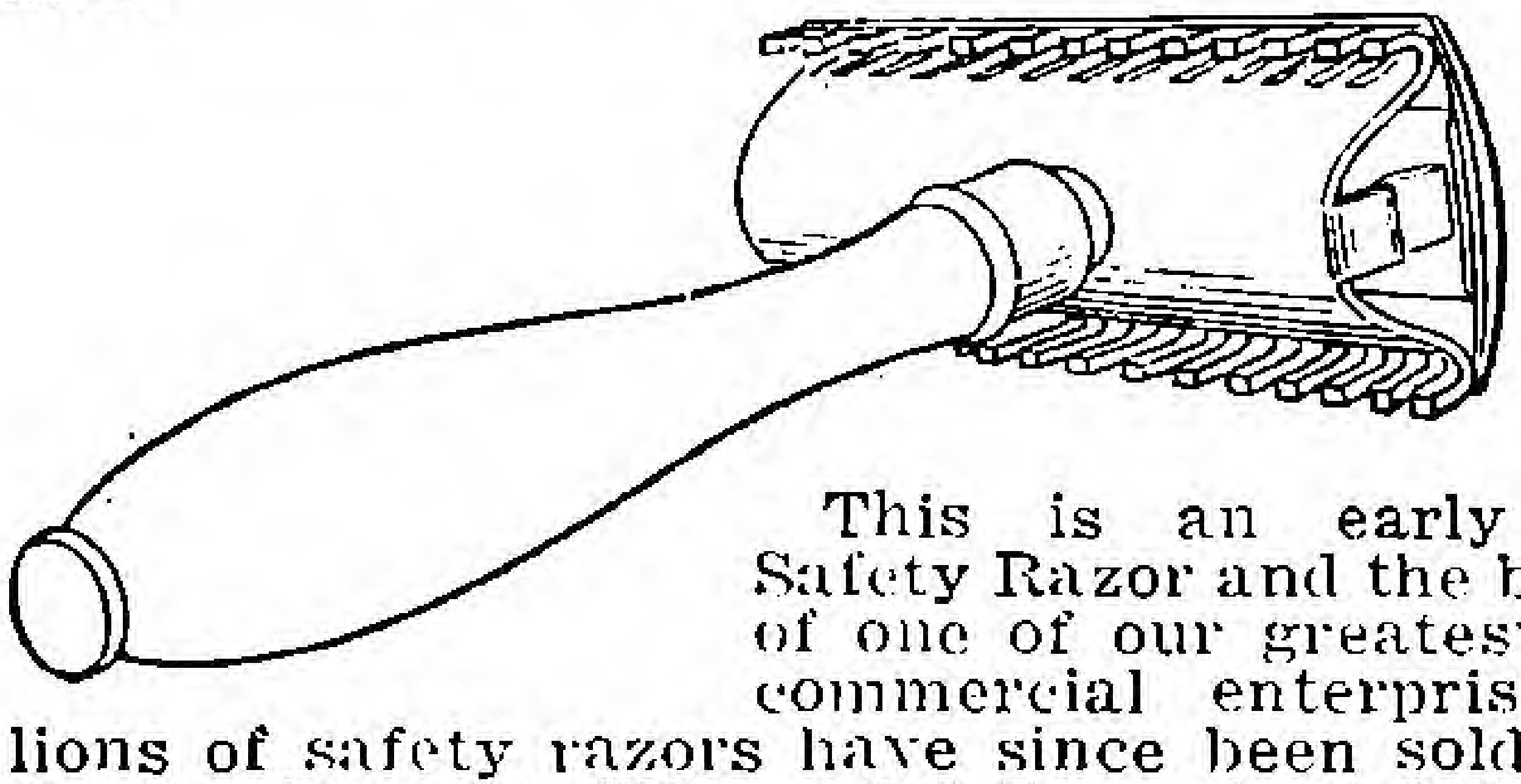

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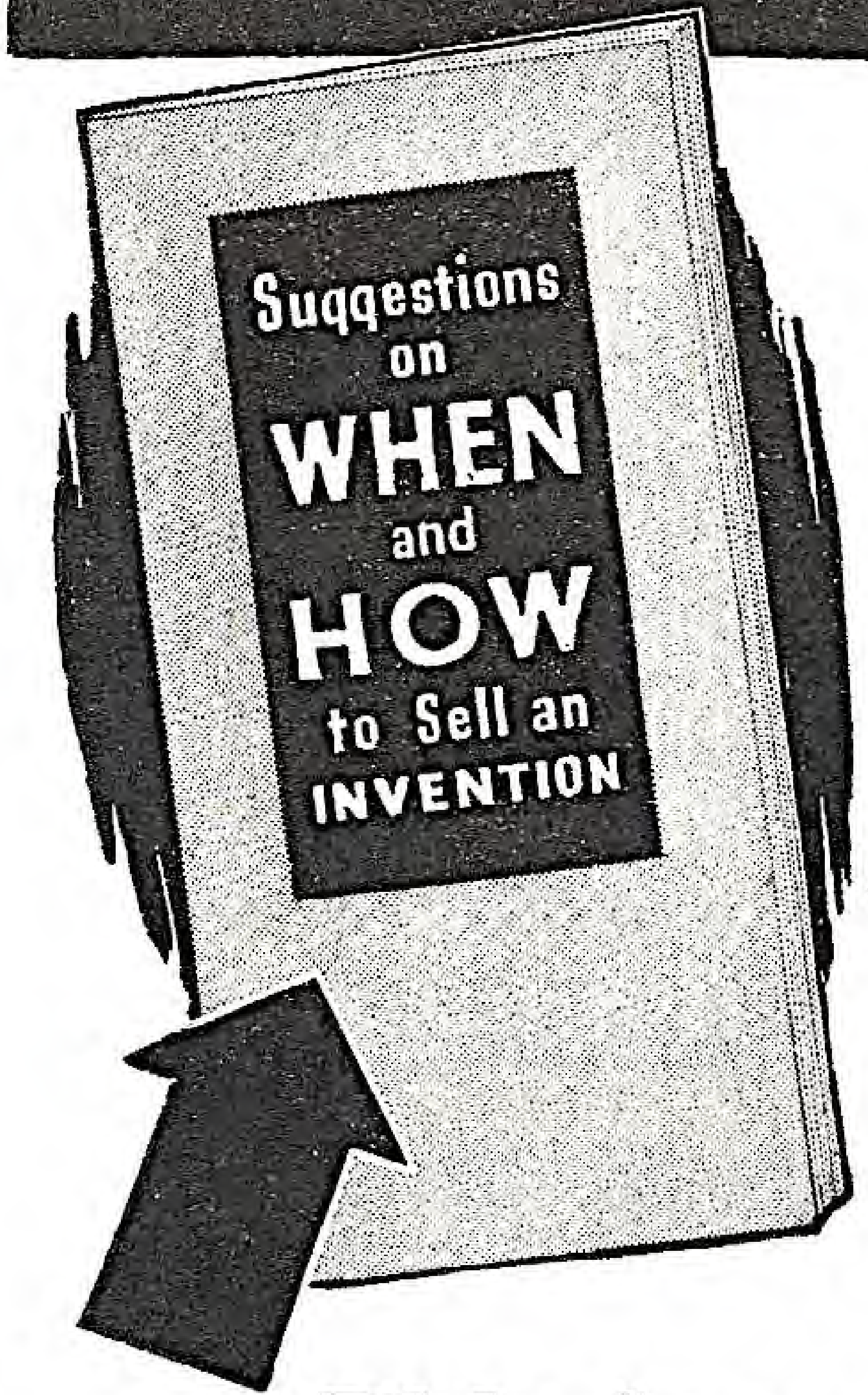
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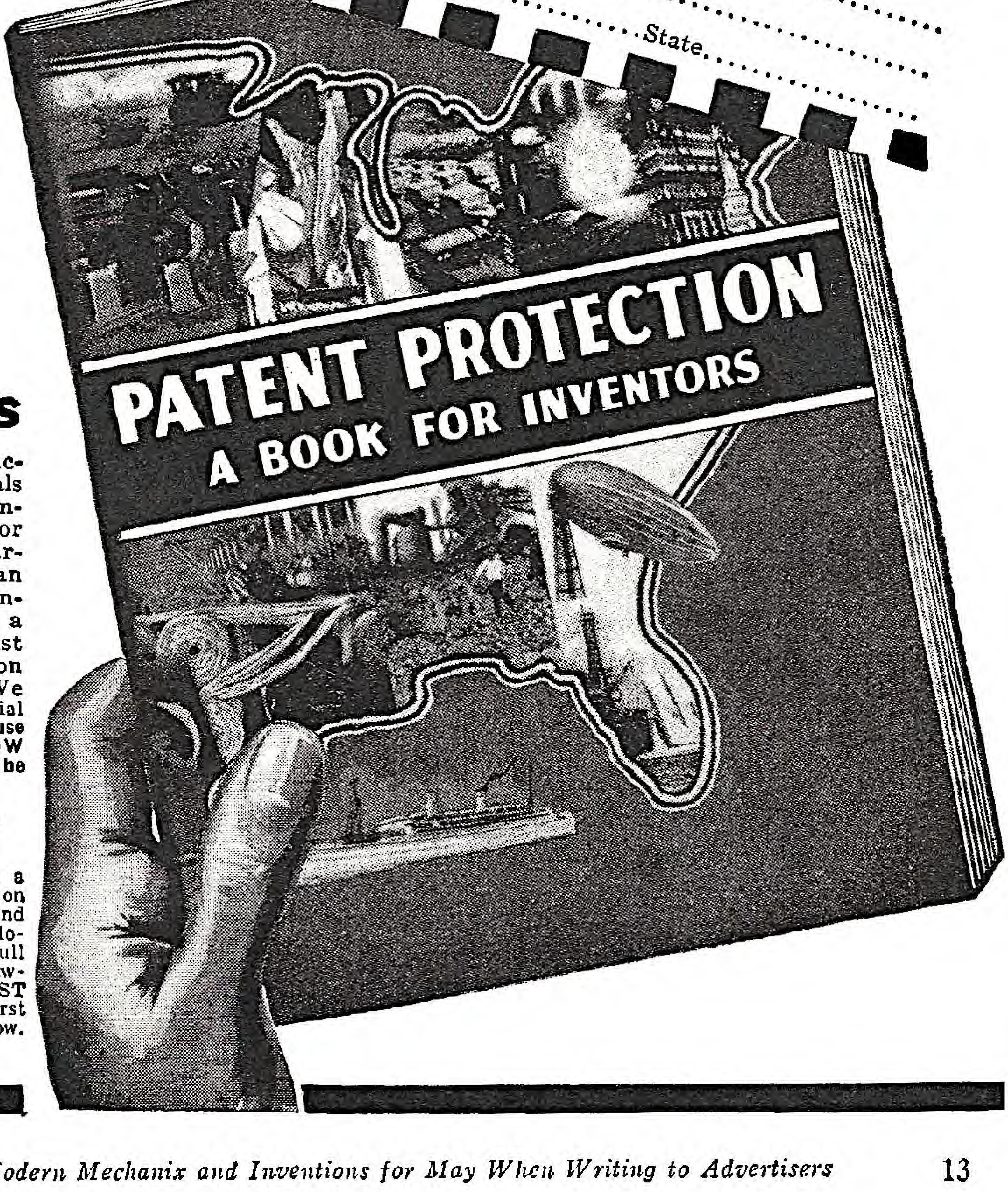

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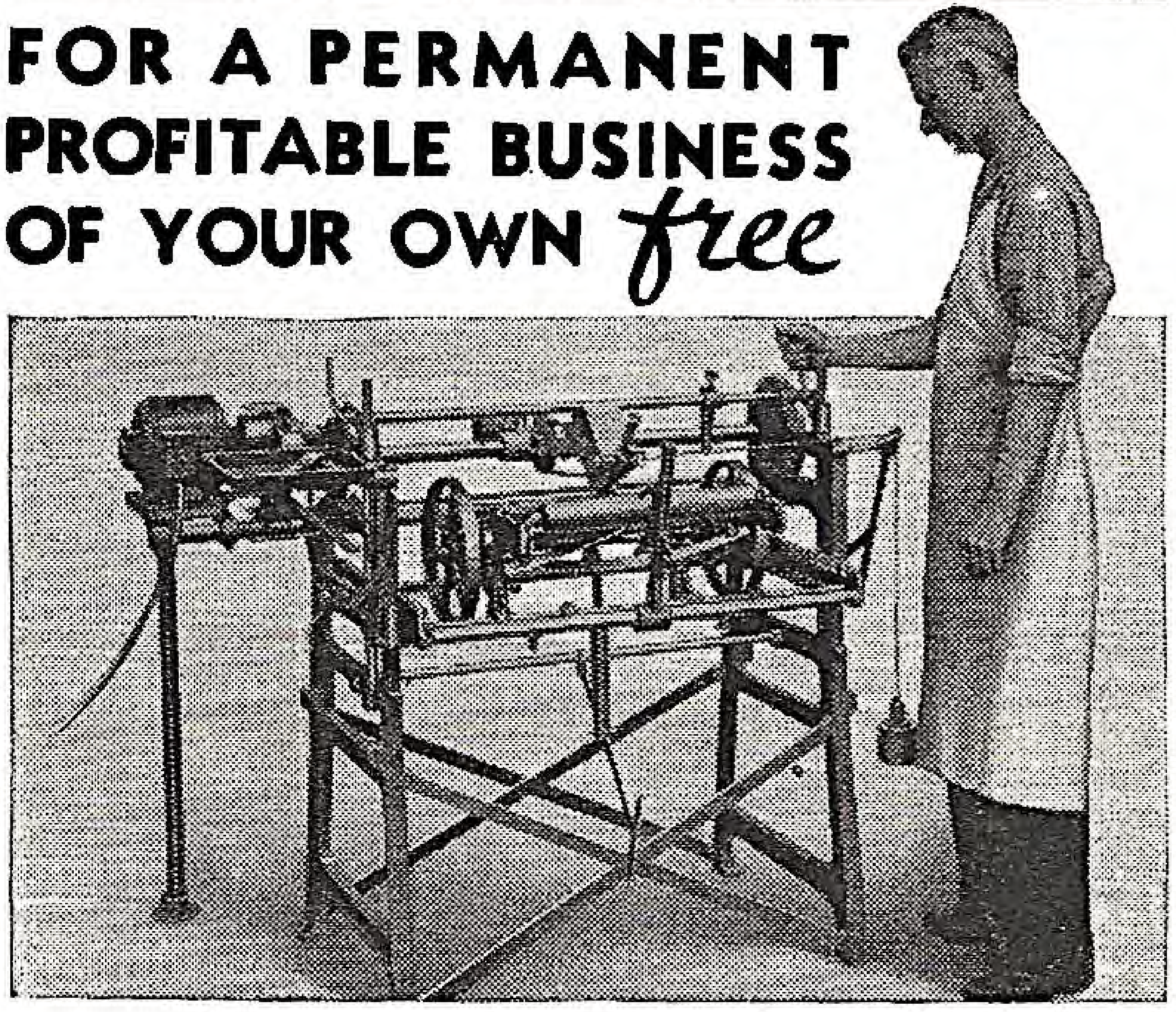

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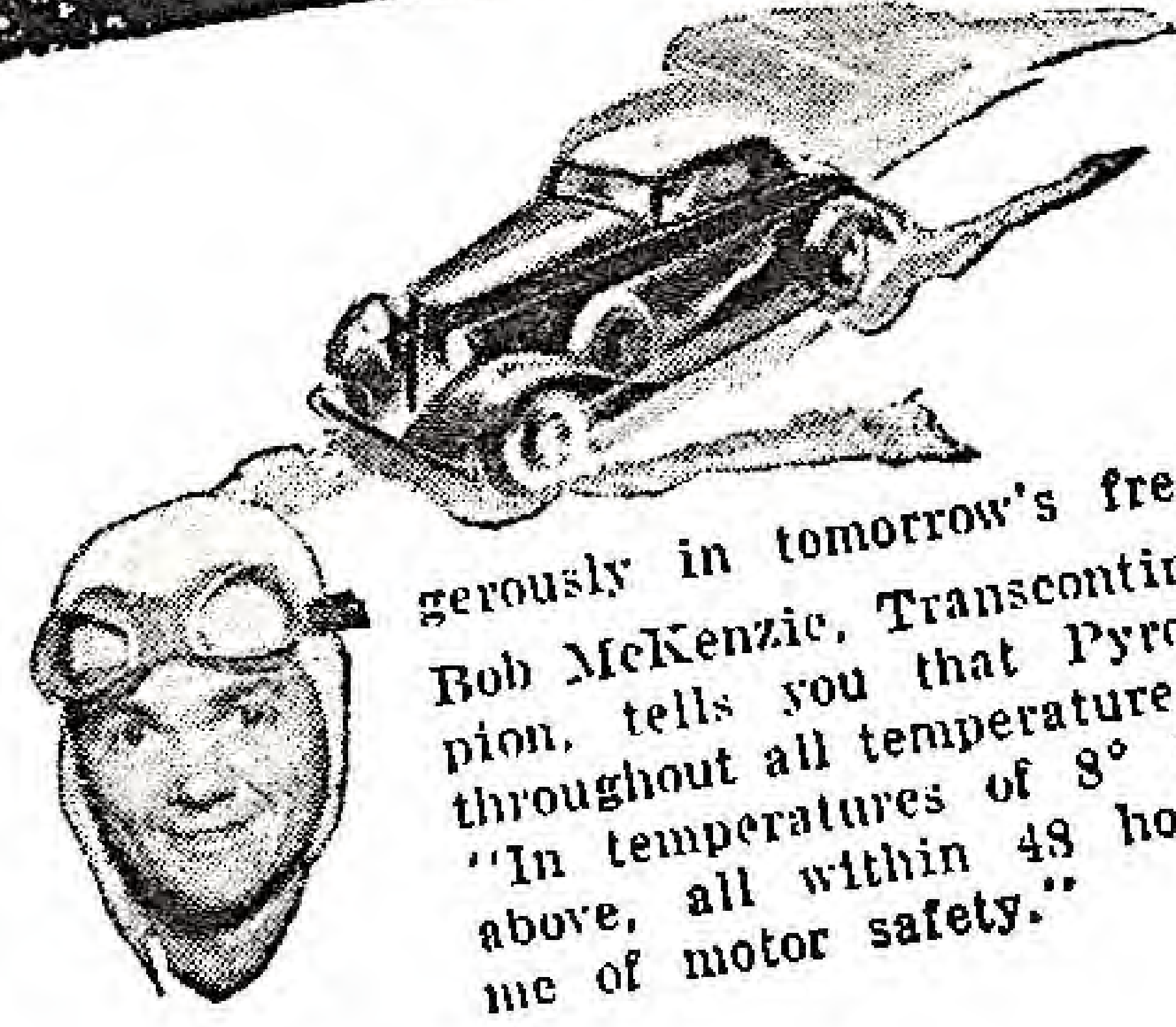

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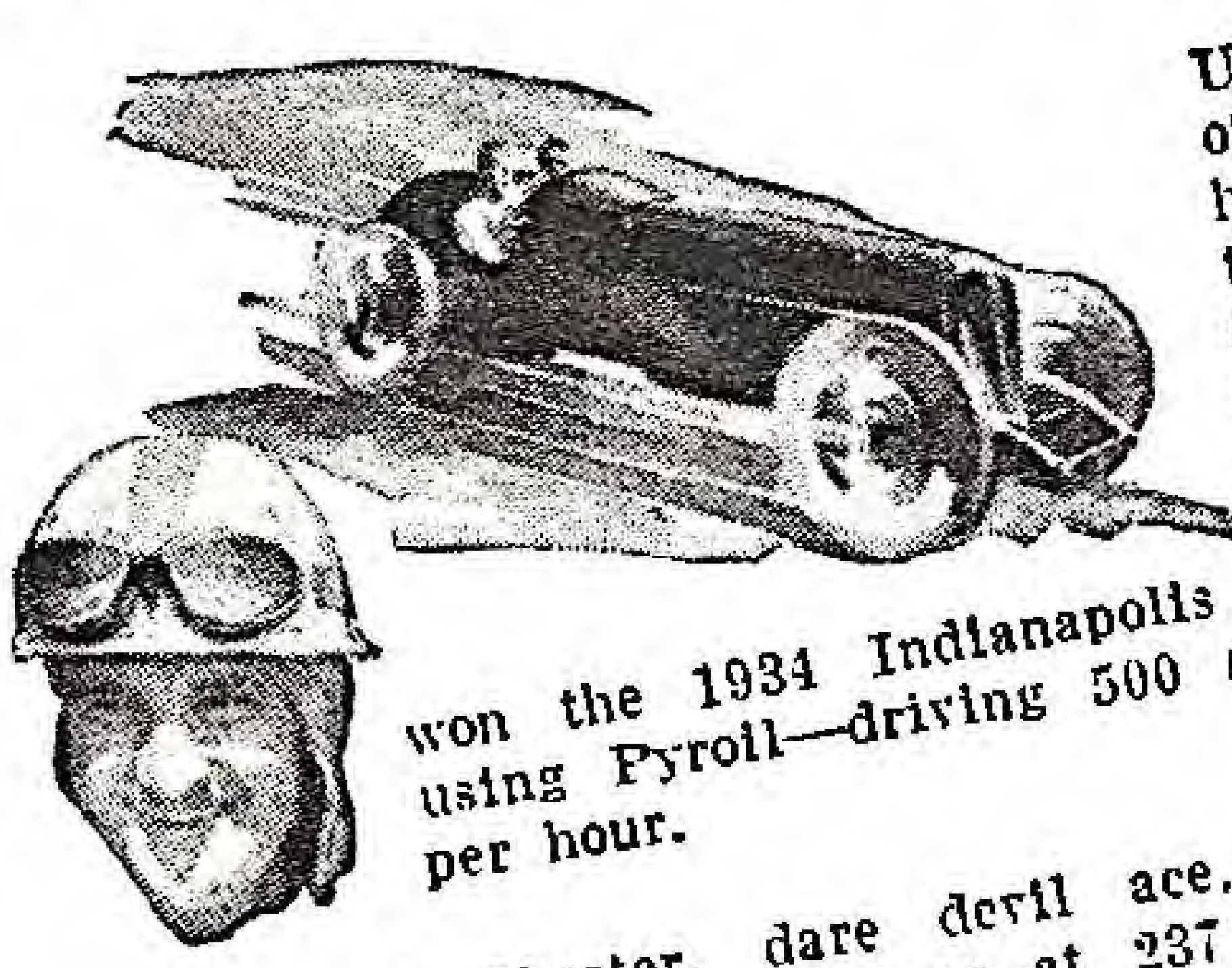

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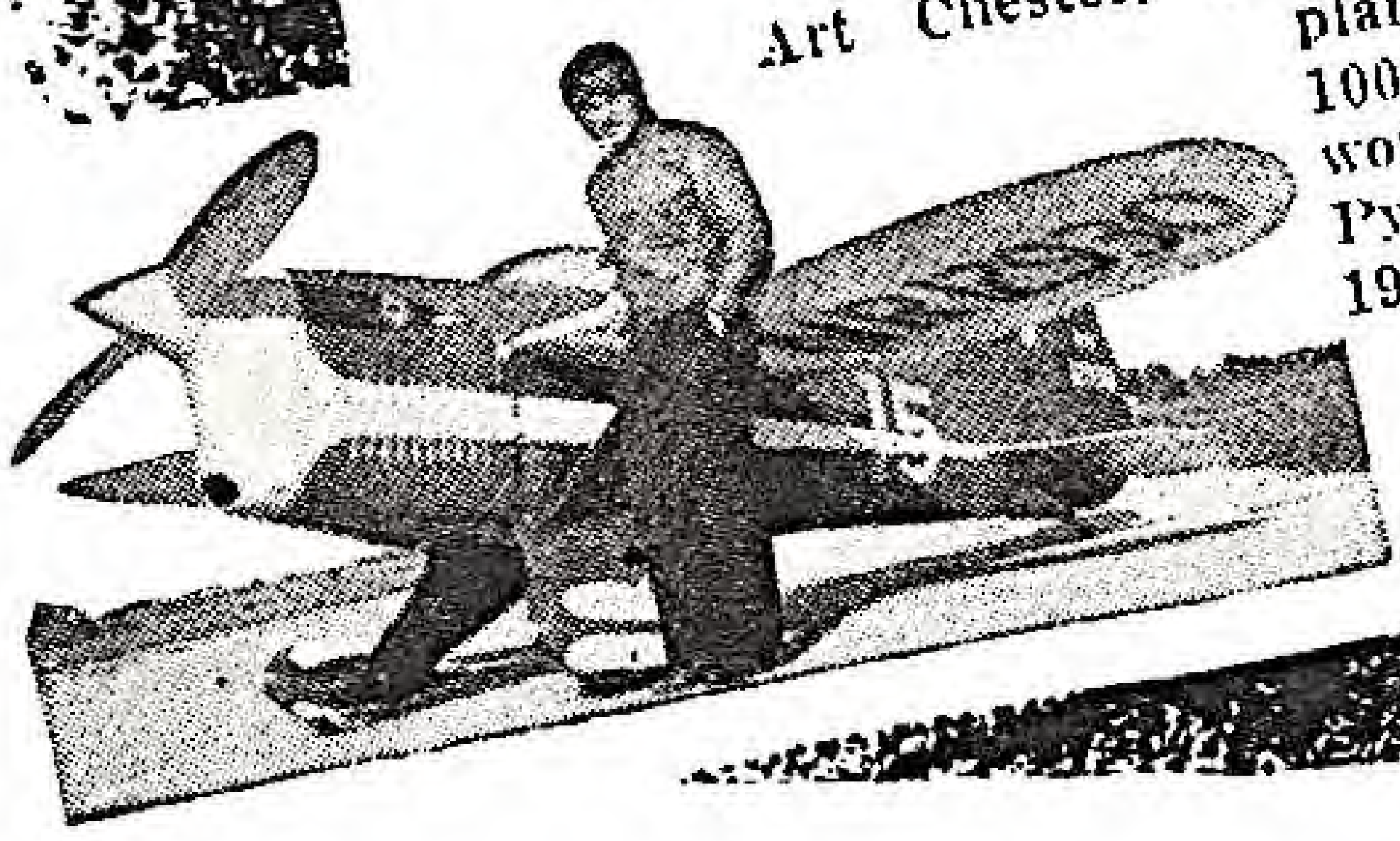

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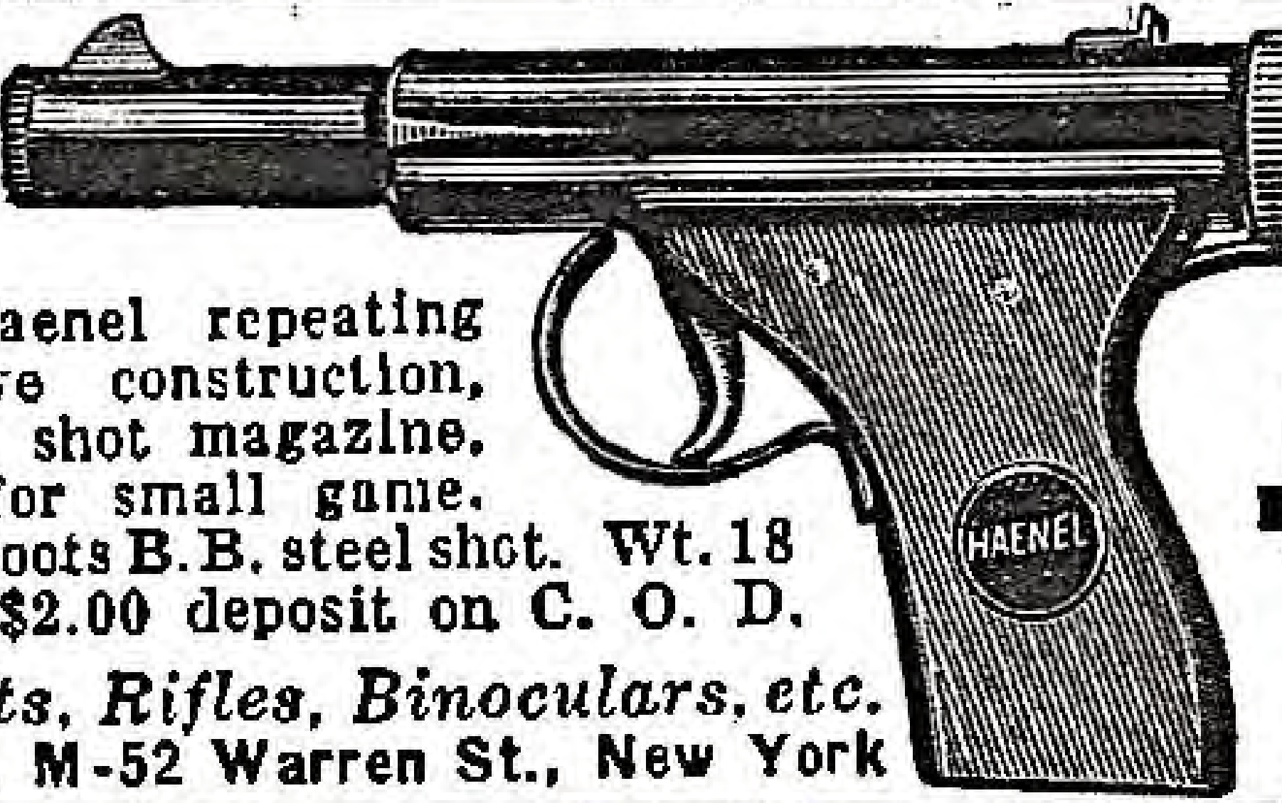

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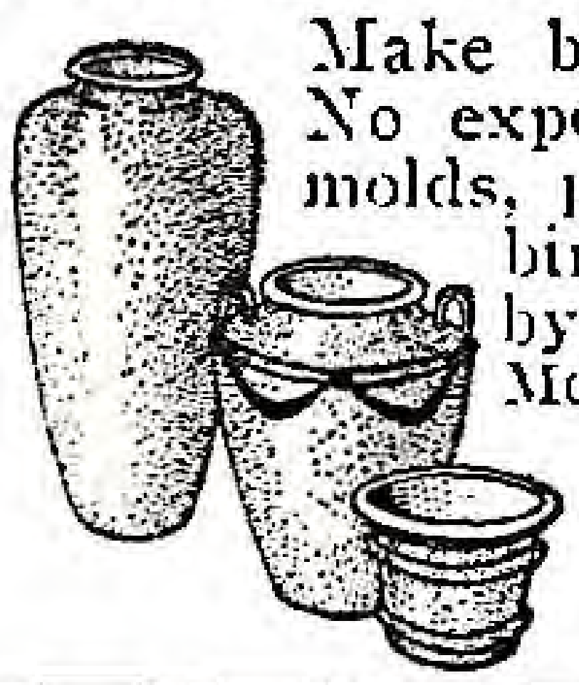

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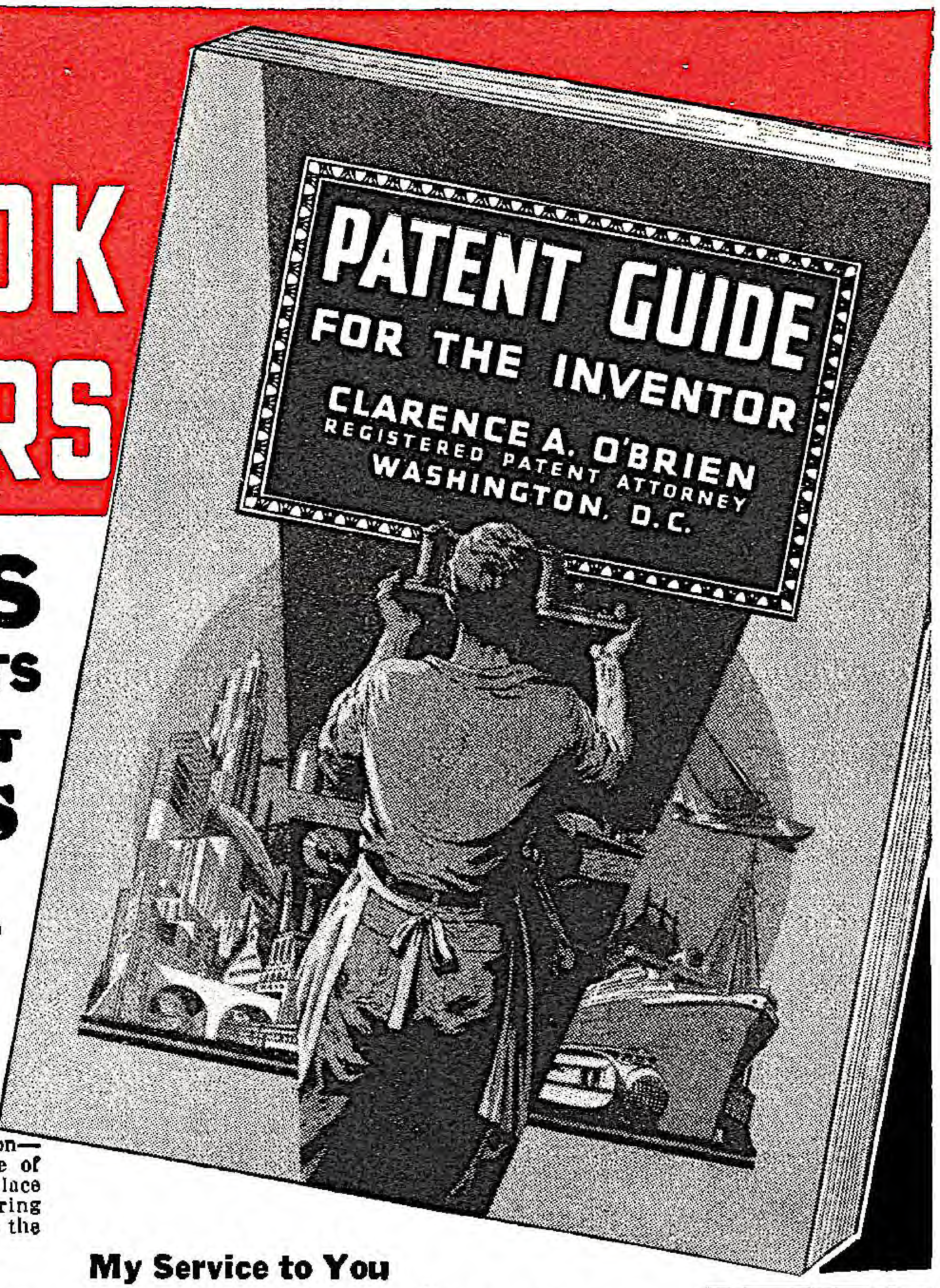

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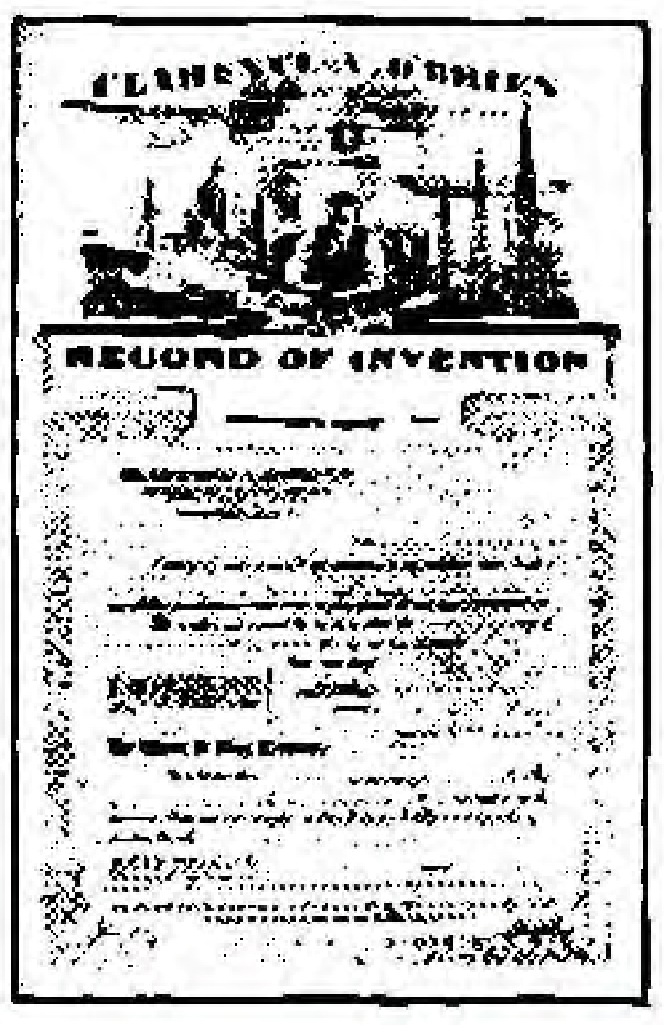

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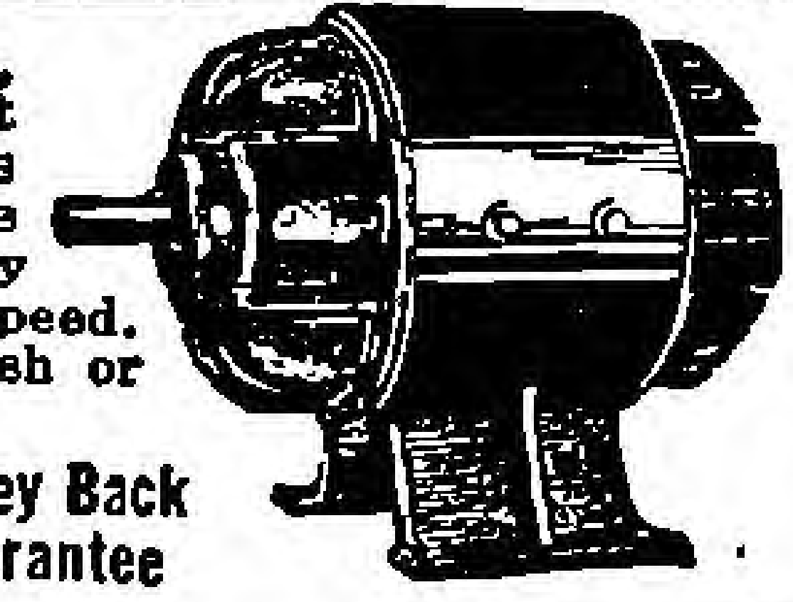

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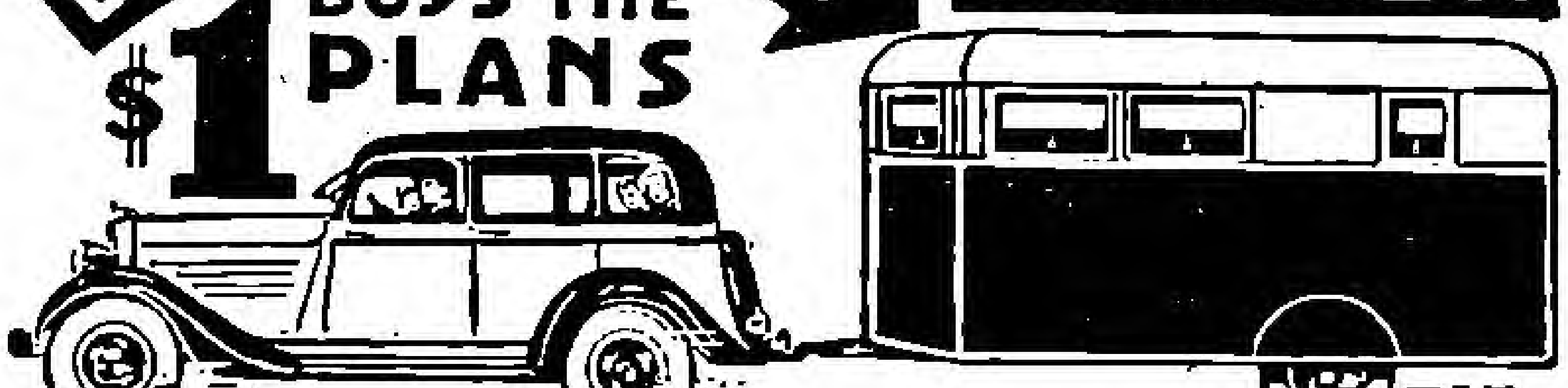

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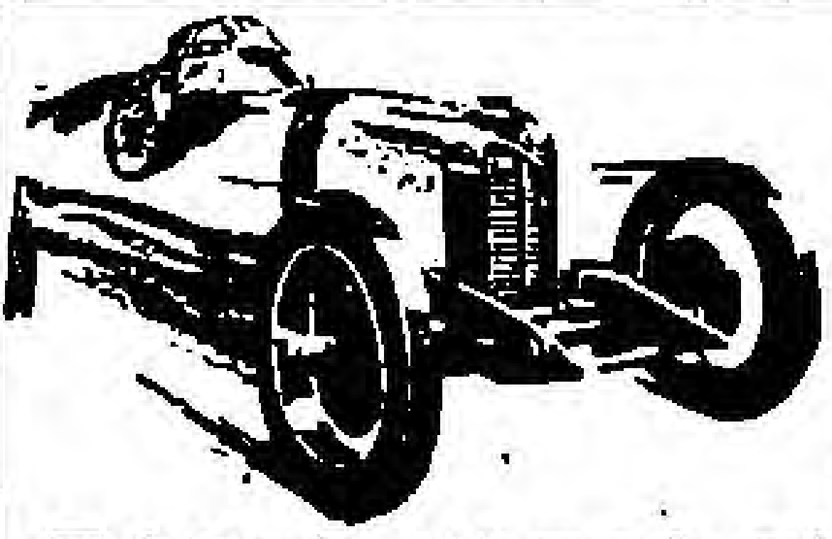

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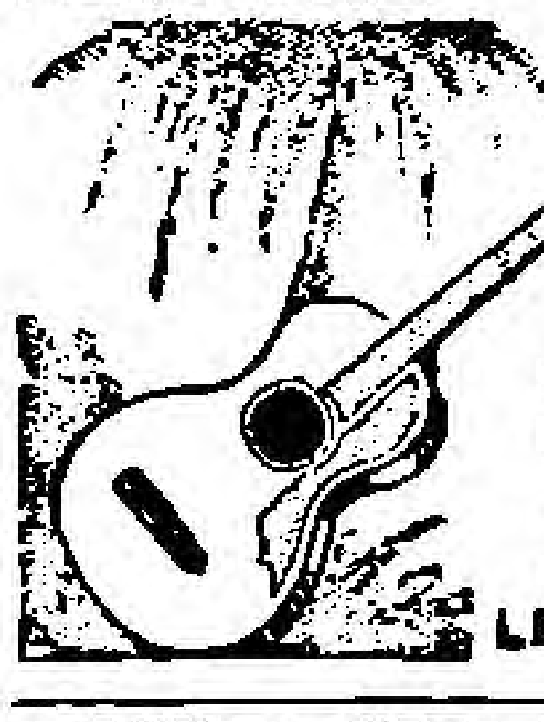

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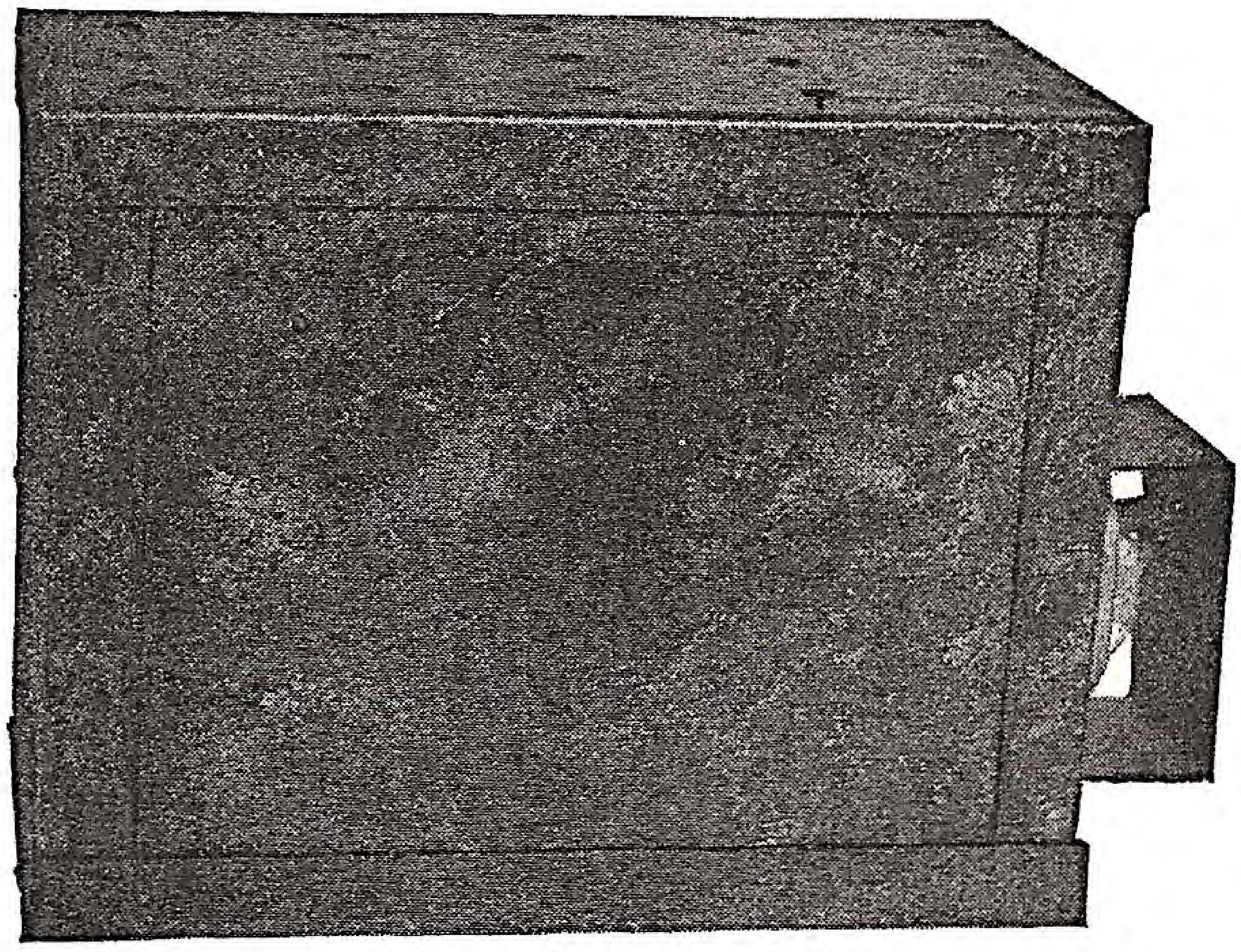

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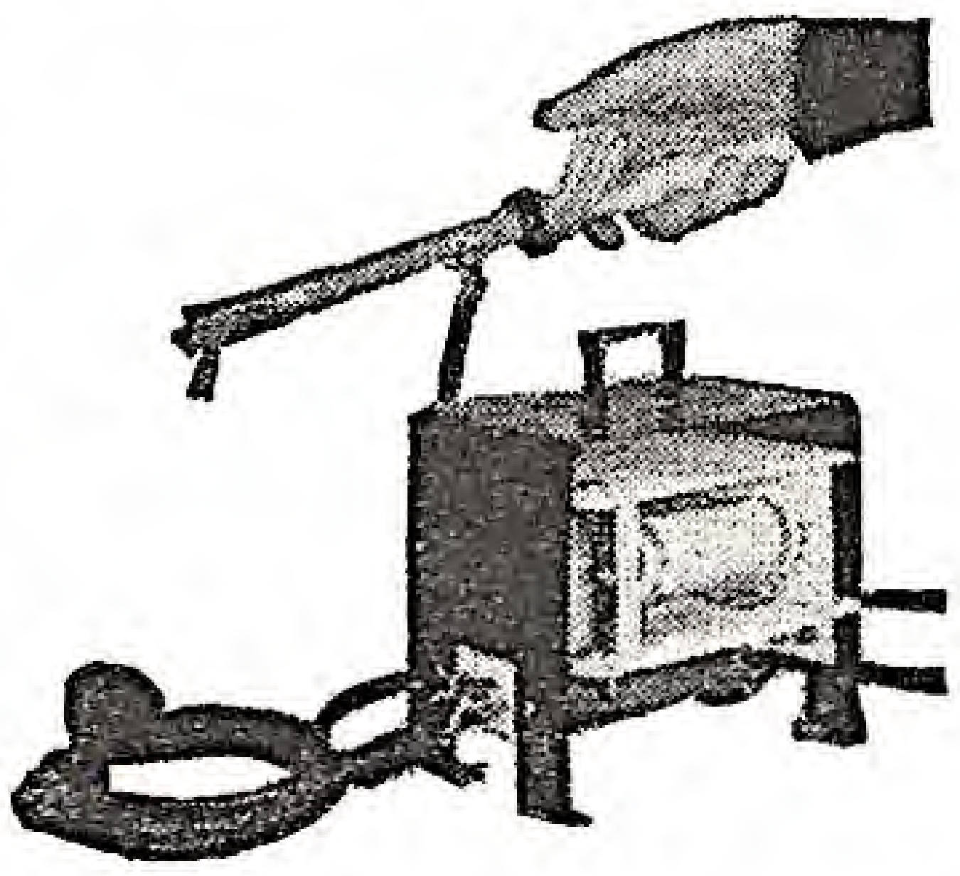

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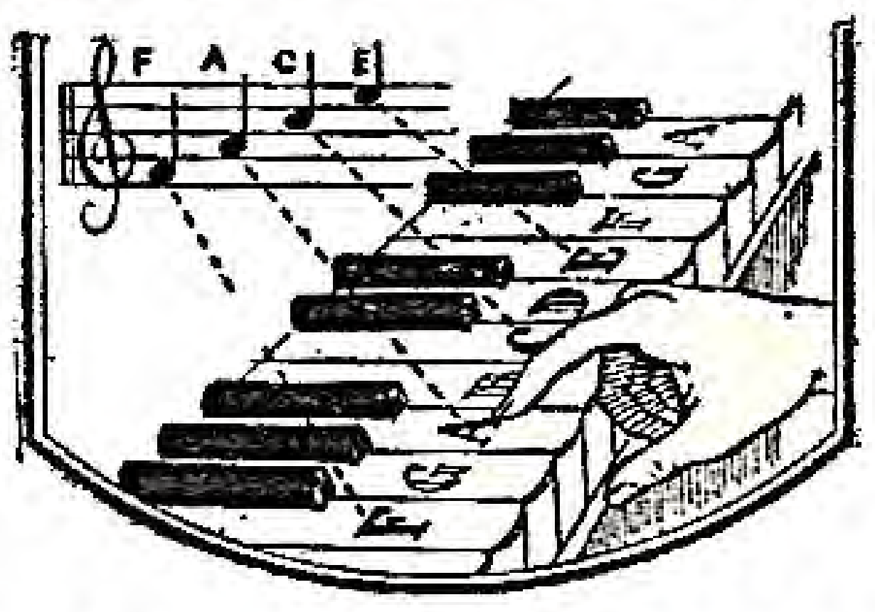

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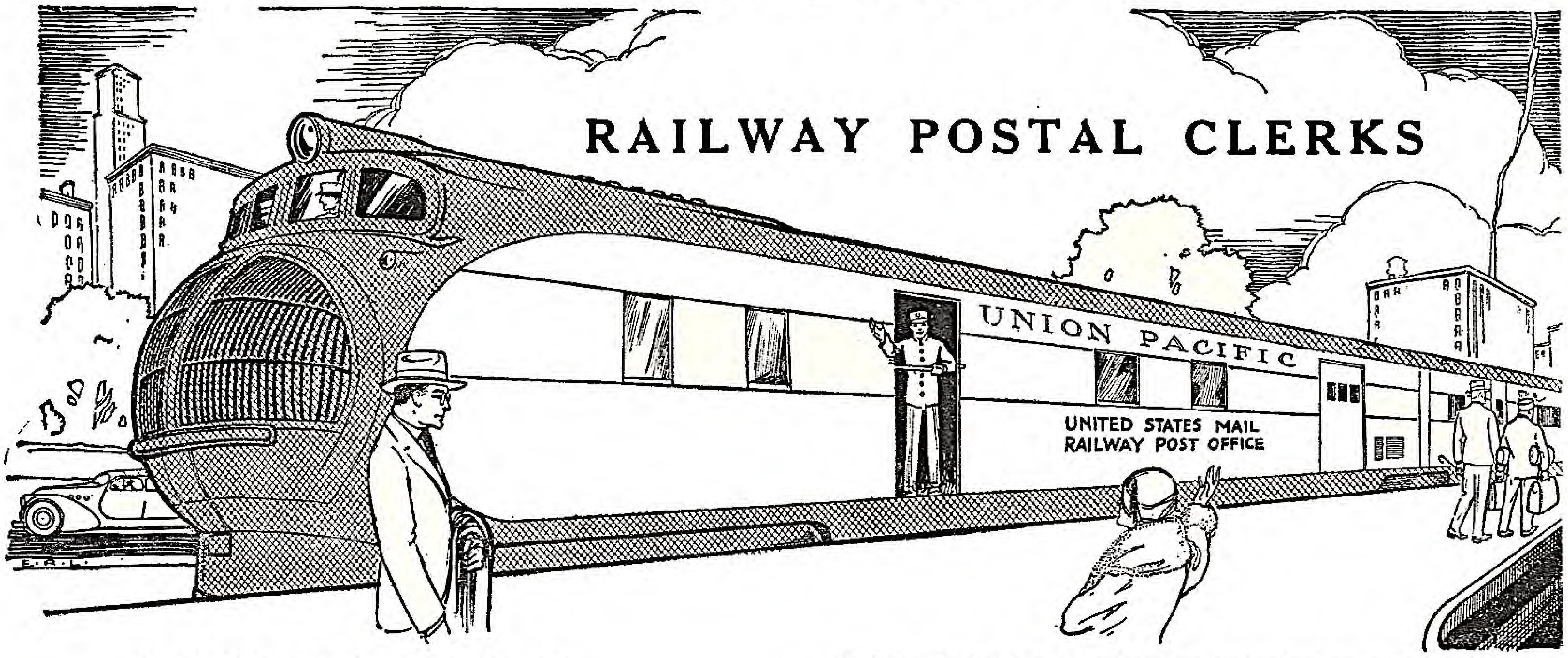

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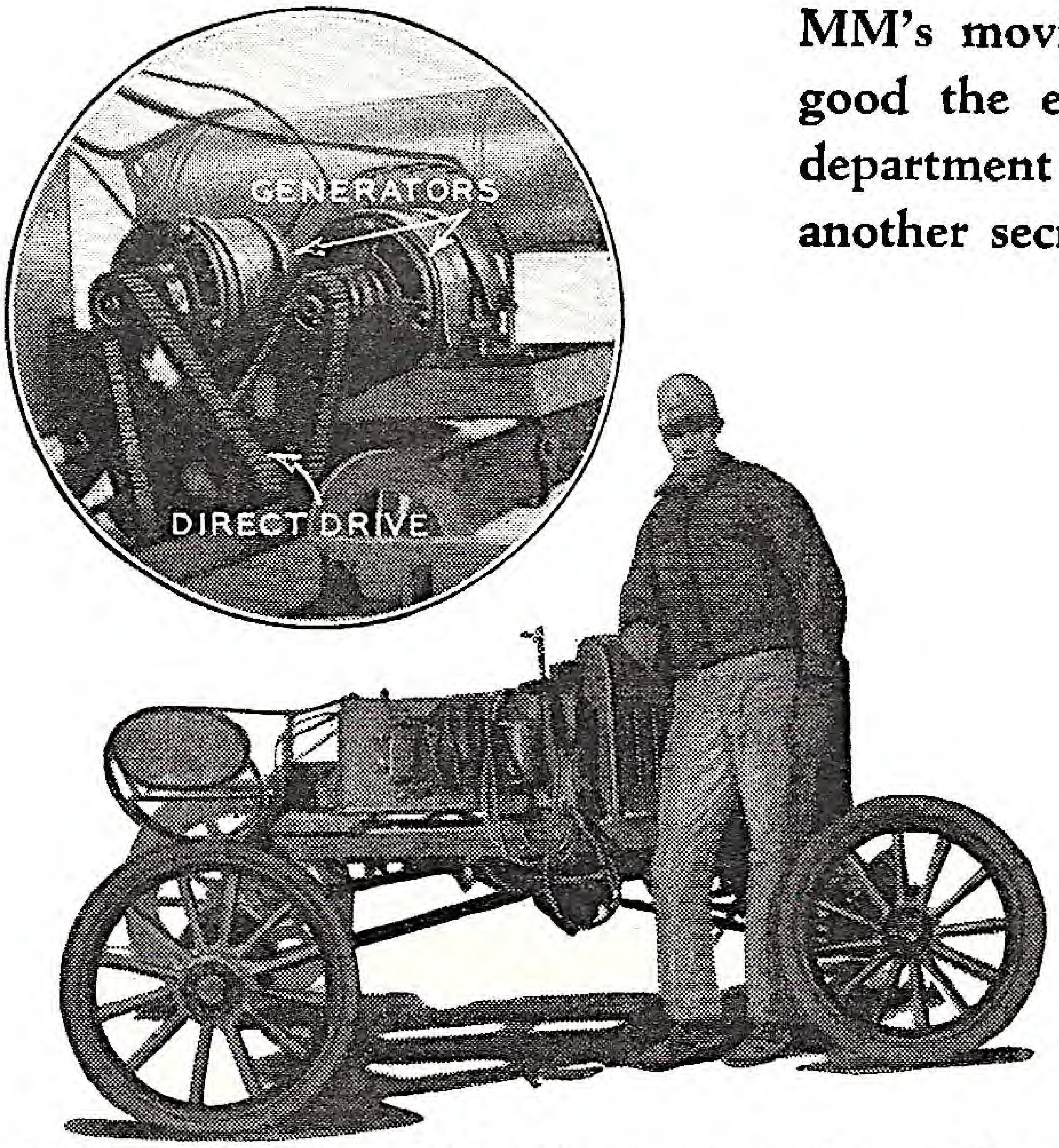
Use This Coupon Before You Mislay It

Random Chips from

MM's movie star's camping trailer looks so good the editor fears you will pass up his department this month. He lets you in on another secret—a new MM all-purpose boat.



Melvin Johnson built two MM welding generators and mounted them on a shortened Ford. He won first prize of $5.00. Upper circle shows the two generators. Photo shows Johnson and welding outfit.

HOW do you like it? "What," you say? Excuse us; we thought you'd know. It's that movie star's trailer we've been raving about. Yes, Sir Guy Standing's collapsible camping trailer on page 94. But before you look it over finish the rest of this department, because, if you ever set eyes on that trailer, you'll run out to order 2x4s, brackets, and pipes for the trailer and forget all about this department.

Before getting off the subject, we'll wager that this trailer will prove the most popular of MM's variety of excellent designs. Aloha, Wanderer, and Bungalow, three of several trailers described in MM's free blueprint catalog, have been going over with a bang, but Sir Guy Standing's trailer will go over like a blast from "Big Bertha."

* * *

Now we'll let you in on another secret. Many of you have been asking for a good all-around boat. Can you imagine a boat that is a row boat, an outboard motor boat, a racing sail boat, and a cruiser—all in one? Sounds a bit fantastic, we admit, and you are probably guessing that it's made of rubber so that it will stretch to suit the various types. Actually it isn't. It is not only practical, but practicable. (Our dictionary tells us that there is a difference.) It was designed by an outstanding naval architect who will tell you how to build it in the June MM. Better ask your magazine dealer now to save a copy for you.

* * *

Melvin Johnson liked the arc welder in the October MM so well that he built two of them. He shortened the chassis of a Ford, disconnected the drive shaft and hooked it up to the two welding generators. The result—an excellent job and first prize of $5.00 in this month's Workbench photo contest. His letter:

Sacred Heart, Minn.

Dear Editor:

I am sending you pictures of the arc welder I made from the October MM. I hooked up two of them on a Ford chassis. I cut off the frame about two feet and welded it together with this welder. I put a Kingston governor on the Ford motor and it works slick.

I can weld anything requiring 160 amperes easy. The plans were easy to follow.

Melvin Johnson.

* * *

One of MM's popular boats, described in "How to Build 20 Boats" and in the blueprint catalog, is the Olympic racing catboat. James Spoor built it, sent us photos, and an interesting long letter. He wins second prize of $3.00 this month. Here's part of his letter:

305 Avenue E, Cloquet, Minn.

Dear Editor:

I am enclosing photos of an Olympic V-bottom racing catboat, as designed by Naval Architect E. B. Shock, which I built from MM plans at a total cost of $70.

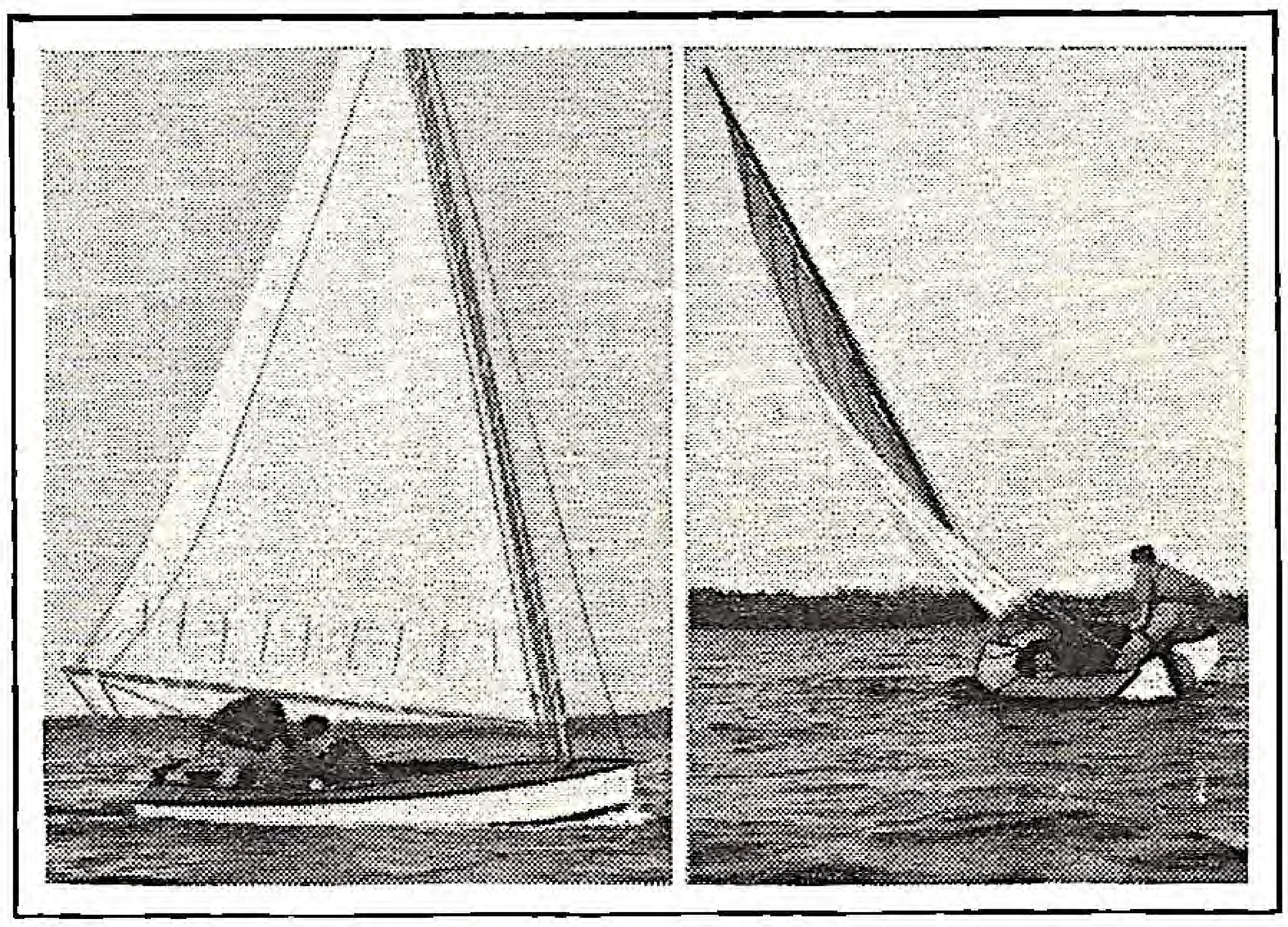
It certainly is a swell boat. It's speed is such that motor boats with light motors are even left behind if they attempt to race. The boat was designed for use in light to moderate wind but is also at home in strong wind and rough water.

the Editor's Workbench

For the mast I got a fine straight spruce tree a little more than six inches in diameter at the butt and about 40 feet long. From this I cut both the mast and boom. After peeling the tree I worked it down to the required diameter for mast and boom.

James W. Spoor.

Spoor adds that anyone desiring advice on building this boat can write him.



James Spoor is enthusiastic about this MM Olympic catboat he built. These two photos brought him the second prize of $3.00.

* * *

The model boat shown in the photos is a scale model job of an actual ship. Peter Buss, Jr., had only a photograph to work from, yet did an excellent job. His letter, third prize winner of $2.00, follows:

Bethlehem, Pa.

Dear Editor:

This is a model of President Roosevelt's vacation cruise ship of July and August, 1934. It is 97 inches long, 14½ inches wide, 49 inches high, and was completely made by hand from a photograph purchased from a newspaper.

It is complete in all essential details:—two lifeboats, three motor launches, two motor barges, and two seaplanes mounted on runways. It is equipped with 6-volt lights above deck and 110-volt lights below. Its weight is about 45 lbs. It is made of 3-ply veneer wood obtained from radio packing crates.

Peter A. Buss, Jr.

Do MM readers like the new roto printing? After the March issue appeared on the stand, we were swamped with letters and cards praising the improved appearance of the magazine. Here are just a few excerpts from many. James P. McCarthy, Franklin, N. M.: **Allow me to congratulate you on the new rotogravure printing which is a great improvement and incidentally the only thing that I see you could improve.** Noal Hatch, Provo, Utah: **I like the new printing and class your magazine as one of the very best on the market.** Evald Johnson, St. Charles, Ill.: **I think the new suit is fine. It is more interesting to read.** Lawrence Landry, Conway, N. H.: **The roto printing is fine. The pictures and subjects show up better.** Ralph Marsh, Bloomingdale, Ohio: **MM looks like a million bucks in its new gown.** Otis G. Feather, Cuzzart, W. Va.: **I think it is a wonderful book. I went 30 miles to get a copy so that I could get the address and become a subscriber.**

[*Continued on page* 24]

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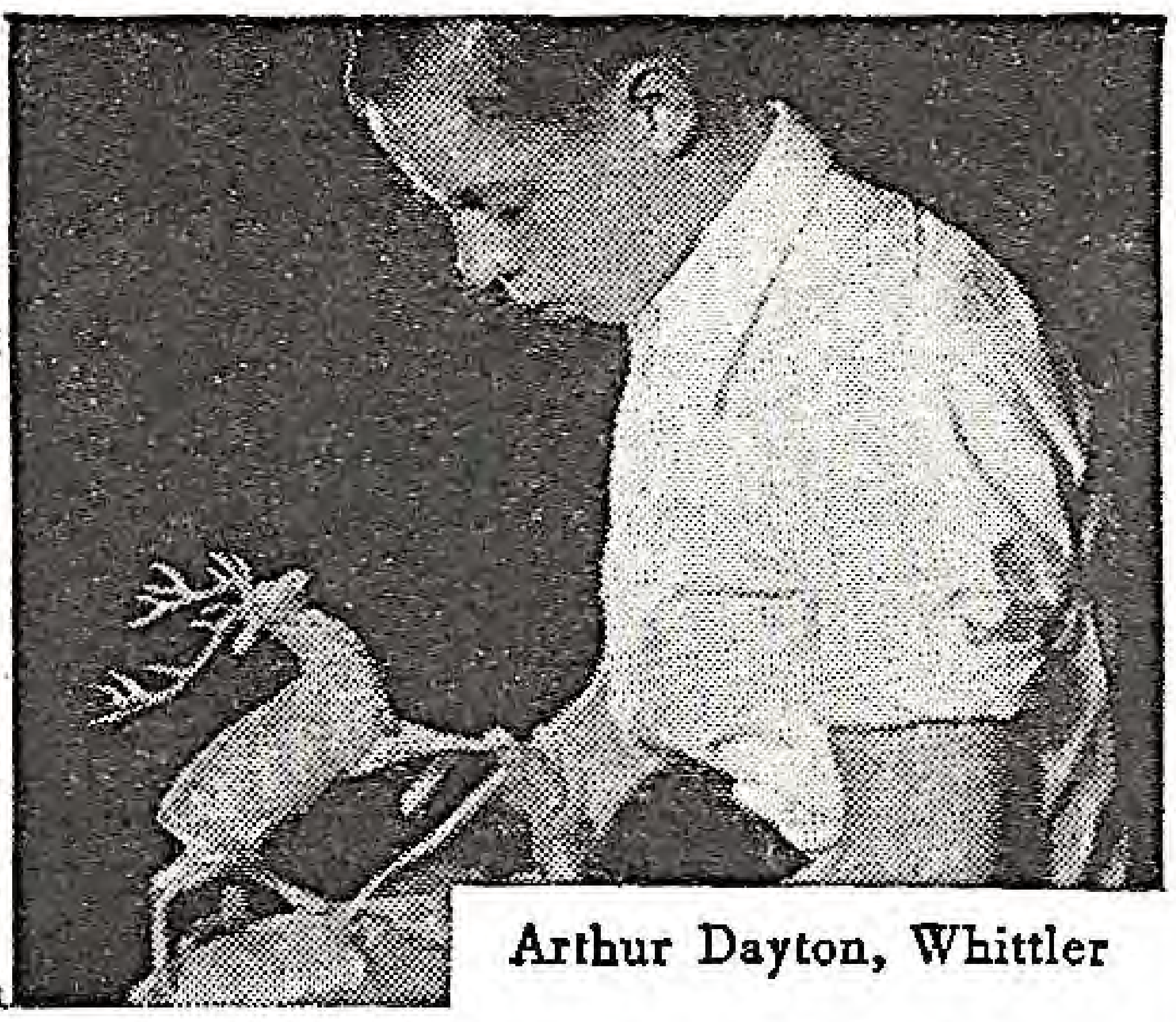
Arthur Dayton, Whittler

THOUSANDS of people who knew nothing about whittlin' until last year are now experts . . . They sent a 3c stamp for Remington's fascinating Whittlin' Book—and what they learned from it started them on a NEW HOBBY! Have you tried to carve anything of wood lately? It's great sport. Send for the book today...then get a razor-sharp Remington Knife (or better still, the Whittlin' Set)—and go to it!

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What's wrong with you? Do symptoms of Constipation, Indigestion, Dizzy Spells, Sweating and Sleeplessness keep you irritable, exhausted and gloomy? Are you Bashful? Despondent? *There's Help for You!* Medicines, tonics or Drugs probably will not relieve your weak, sick nerves. My wonderful book "*Watch Your Nerves*", explains a new method that will help you regain lost vitality and healthy nerves. Send 25c for this amazing book. ROBERT HOLMES, 135 Fuller Bldg., Jersey City, N. J.

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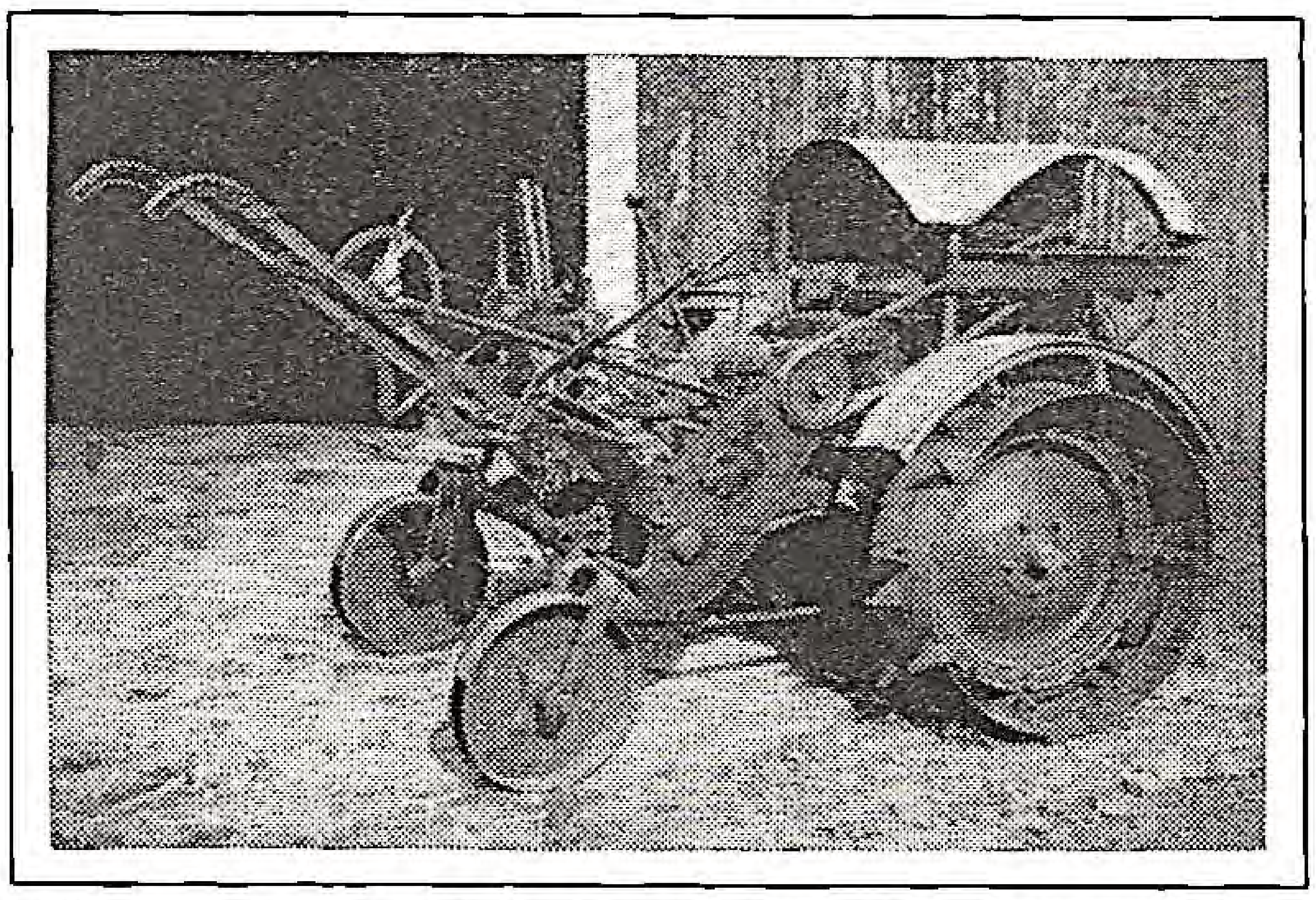
Chips from the Editor's Workbench

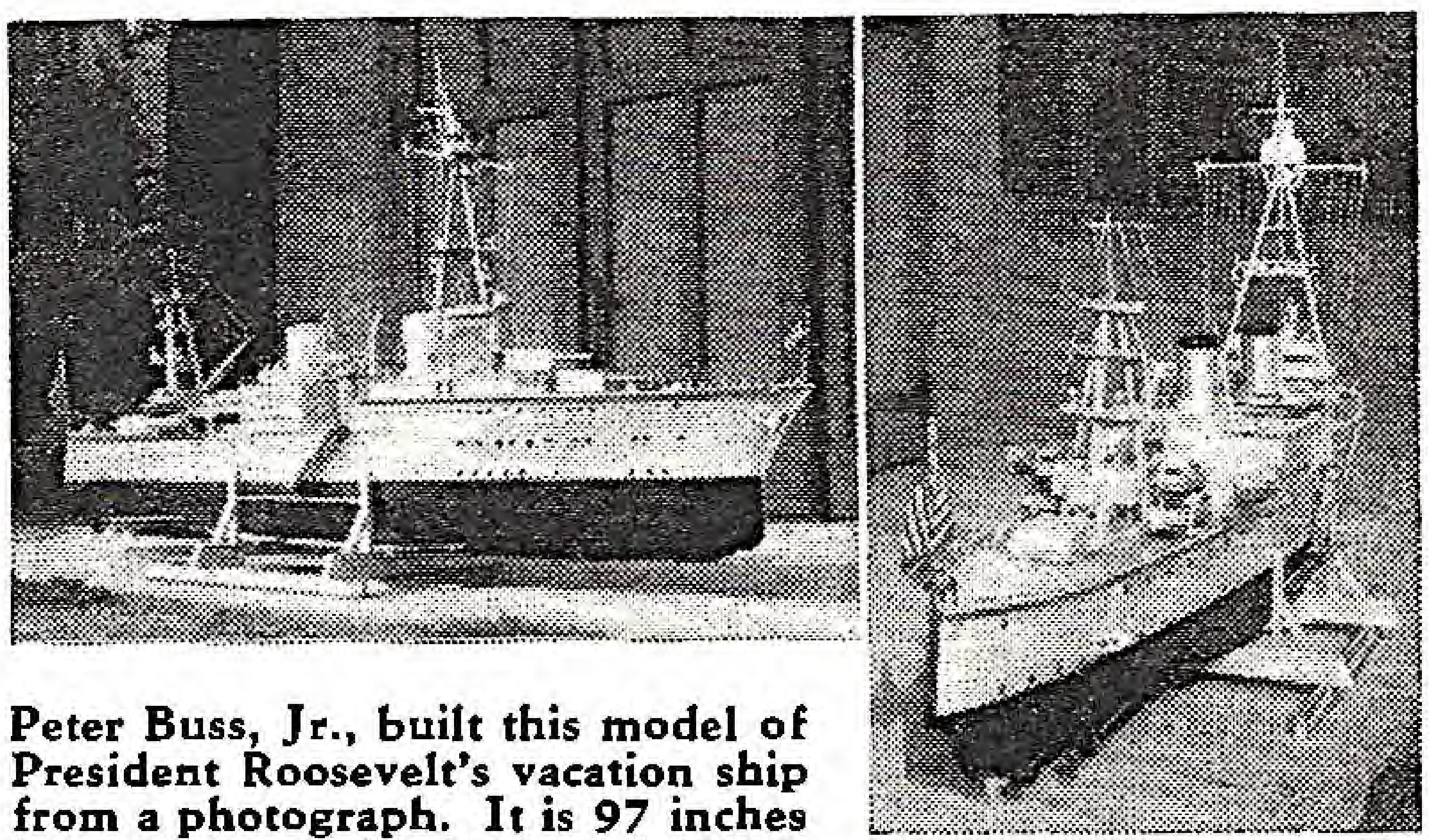
[*Continued from page 23*]


This tractor was built by Harvey Rompfer, of Rogue River, Ore. For heavy loads and plowing he uses 150-lb. drive wheels. The motor is a 1928 Henderson with throttle governor control. The drive wheels shown are 32x8 inches.

And here are a batch of interesting odds and ends, a sentence or two from a few of the hundreds of letters that come to the Workbench every month. William K. Scruggs, Raleigh, N. C.: **I won second prize in the Raleigh Christmas decoration contest using ideas from your January issue. This was the first one of your magazines that I ever bought, but I am getting it from now on.** William Harrier, Roseville, Ohio: **I have completed the auto radio in the September, 1934, MM. I receive Los Angeles police calls during the day and KFI, which is 2,000 miles, most any night with plenty of volume. I built the set complete for less than $10.** Roy F. Crabb, San Francisco, Calif.: **I have four editions of your Flying Manual. There's more real, understandable meat in those four books than in the whole of my expensive collection of highly involved aviation textbooks.**

Here are some suggestions from MM readers. From L. E. Rice, of New Orleans: **By all means, let us have more articles on model railroads.** Carl Wilhelm, Table Grove, Ill.: **Why not get out an index each year of the workshop articles in MM?**

We want to give our readers articles on the subjects that interest them. What do you want?


Peter Buss, Jr., built this model of President Roosevelt's vacation ship from a photograph. It is 97 inches long. It took third prize of $2.00.

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Grinds, routs, drills, carves, sharpens, cuts, engraves. Over 100 wheel shapes available. Fits the hand perfectly. Weighs 1 pound. **For use at home, in the shop or take to the job. Do away with slow hand work!** A. C. or D. C., 110 volt, 13,000 r. p. m.

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If you're satisfied with what you're making—If you're content to just hold onto your present job—If you see no advantage in modernizing your training—Then—This coupon doesn't interest you! ● BUT—If you'd like to follow the path to more money, already blazed by thousands of ambitious men, then this coupon may be the turning point in your earning career!

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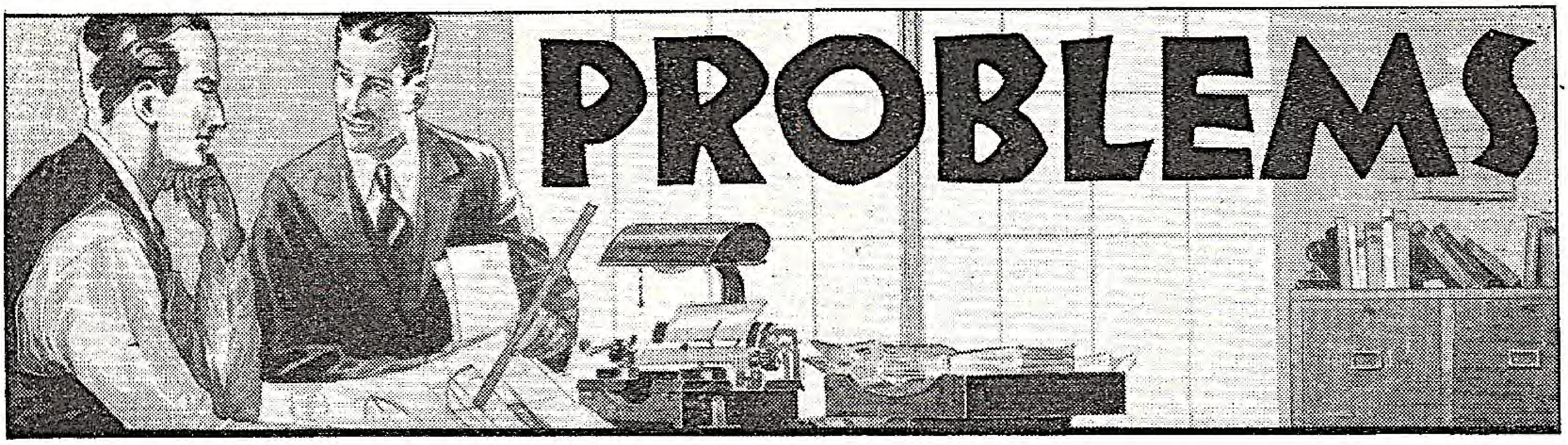

These letters were selected from the daily mail of the Problems Editor.

DEMAGNETIZING TOOLS

Tools and work placed on a magnetic chuck become magnetized. Can you tell me how to build a demagnetizing unit?—W. T., Brooklyn, N. Y.

Wind about 1,000 turns of No. 20 to No. 24 enameled wire into a one foot diameter coil in the shape of a doughnut. Connect the coil across a 110 or 220 volt A. C. line. Metal objects passed slowly a few times in and out of this coil will be demagnetized. The size of the coil may be varied to suit your particular needs.

RADIO ACTS AS TRANSMITTER

I can plug my two-tube all-wave electric radio in anywhere in the house, connect a microphone or phonograph pickup to the headphone terminals, and broadcast to any other radio in the house. I do not connect aerial or ground on the transmitting set. Why does this act as a transmitter in my own house, yet not broadcast to other radios in the vicinity?—J. T., Draper, N. C.

Your short wave set is performing exactly like the Cakepan Transmitter, plans for which appear in the Radio Builders' Manual. The signals are going through the electric light wires, but are not strong enough to travel any distance. Many regenerative sets can be made to perform in this manner.

AUTO ENGINE "SWEATS"

What causes the motor of my 1929 Chevrolet to form water vapor inside the head? The plugs foul, and the engine will not fire evenly until warm enough to evaporate the moisture. The trouble is more pronounced in cold weather or after a cool night.—C. W. E., Lostant, Ill.

The vapors of combustion in any gasoline engine contain a high proportion of water. This is the only possible source of water inside the combustion chamber, if the gaskets do not leak. Greater clearance on the exhaust valves may eliminate your trouble.

BOAT BALLAST TANK

Would a 50-gallon ballast tank running about three-fourths the length of my 18-ft. boat, along the keel, make it more seaworthy in heavy seas?—V. T., Pelham, N. Y.

Any weight below the center of gravity will improve the stability of a boat. A pump should be installed to empty the ballast tank in calmer weather. Added weight makes a boat more sluggish. Be sure your tank is heavily galvanized inside and outside.

STORING LIGHT-SENSITIVE SOLUTIONS

Is it necessary to store the sensitizing solution used in printing photographs on metal in a dark room? Can an ordinary light be used in place of the arc light when printing by this process? (described in the January 1935 MM)—W. K. H., Springfield, Mass.

Solutions which are sensitive to light should be kept in dark brown bottles, in a dark, cool location. A photo-flood lamp will be somewhat slower and more expensive than an arc light for printing, but will give good results. Ordinary bright daylight may be used by experimenting with the period of exposure.

USES FOR SOY BEANS

Can you tell me whether it is possible to obtain literature describing the processing of soy beans?—O. R. C., Avon, Ill.

A list of the government bulletins covering soy beans growing and processing may be obtained free of charge from the Superintendent of Documents, Government Printing Office, Washington, D. C. For literature on the process of converting soy beans into auto parts write the Ford Motor Co., Detroit, Michigan.

(Editor's Note—All letters sent to this department should include a stamped, addressed envelope. Write to M-M Problems Editor, 529 So. 7th St., Minneapolis, Minn.)

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THIS lathe turns, faces, bores, cuts screw threads 4 to 40 per inch, does chucking work and performs all general machine operations on cast iron, steel, other metals, woods—all kinds, hard rubber, fibre, bakelite, compositions, etc.

FEATURES: This powerful, accurate lathe is constructed entirely of cast iron and steel. Has graduated compound rest, automatic longitudinal feed, ¾" hole thru spindle, and 35 other modern features. Other bed lengths 3½', 4', 4½'. Full description in Free Illustrated Book No. 5-W.

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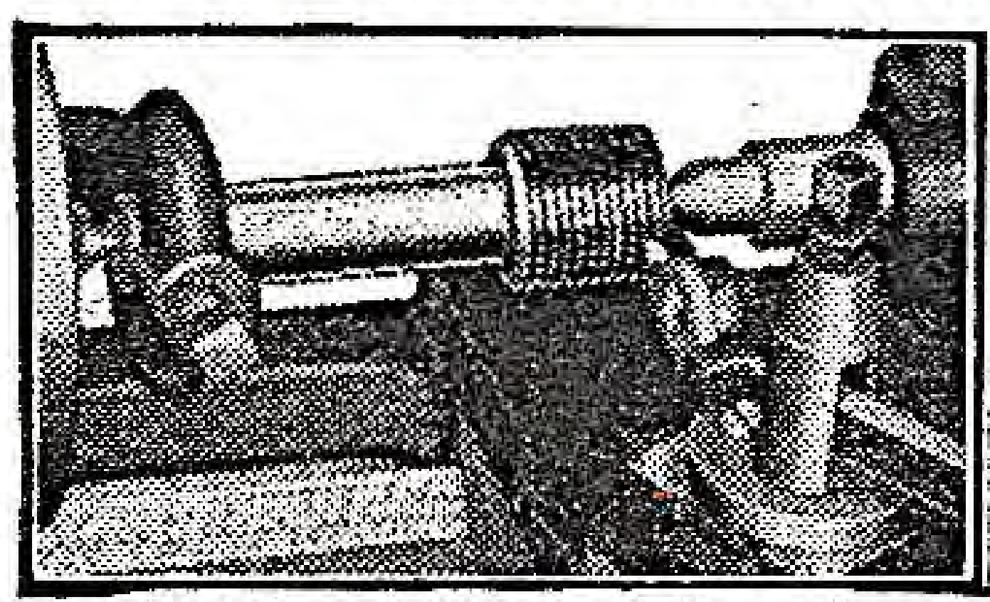
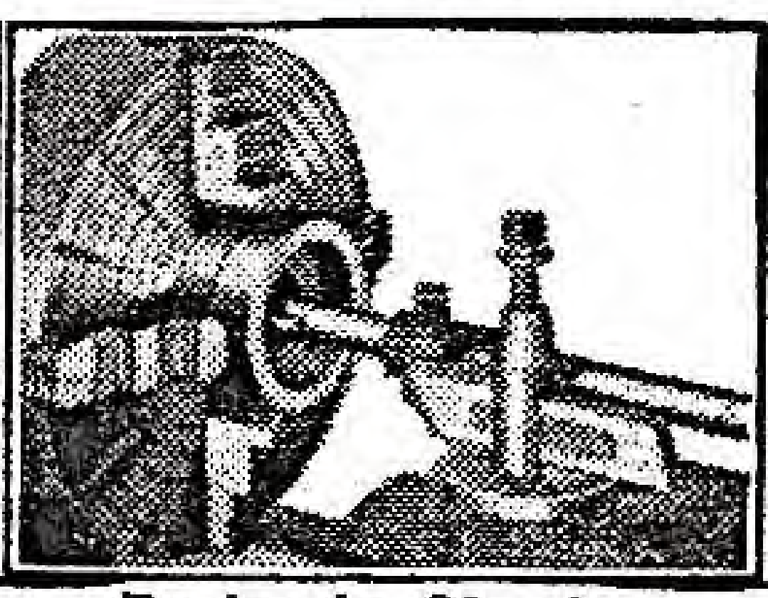
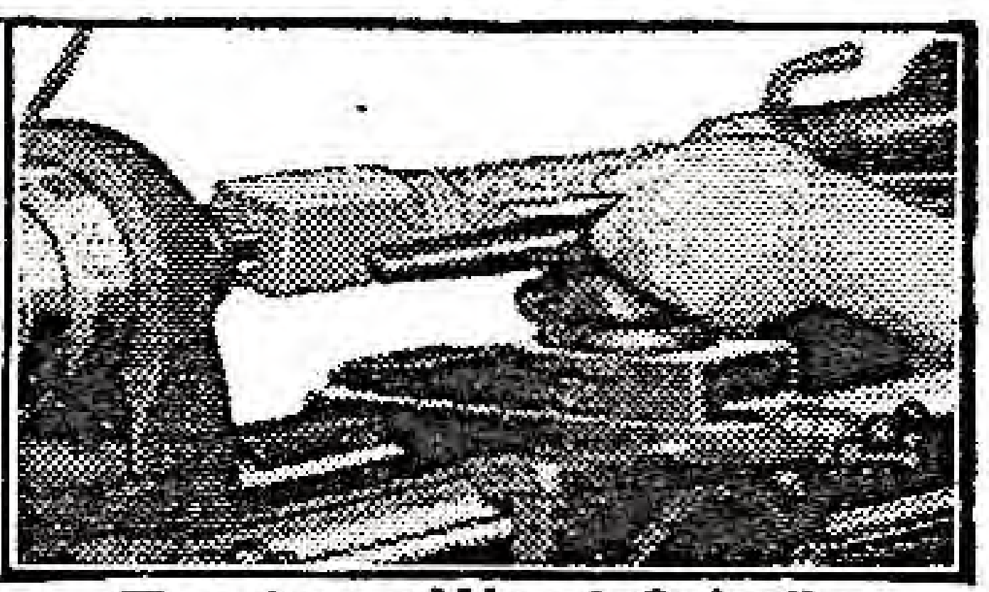


Cutting a Screw Thread



Boring in Chuck



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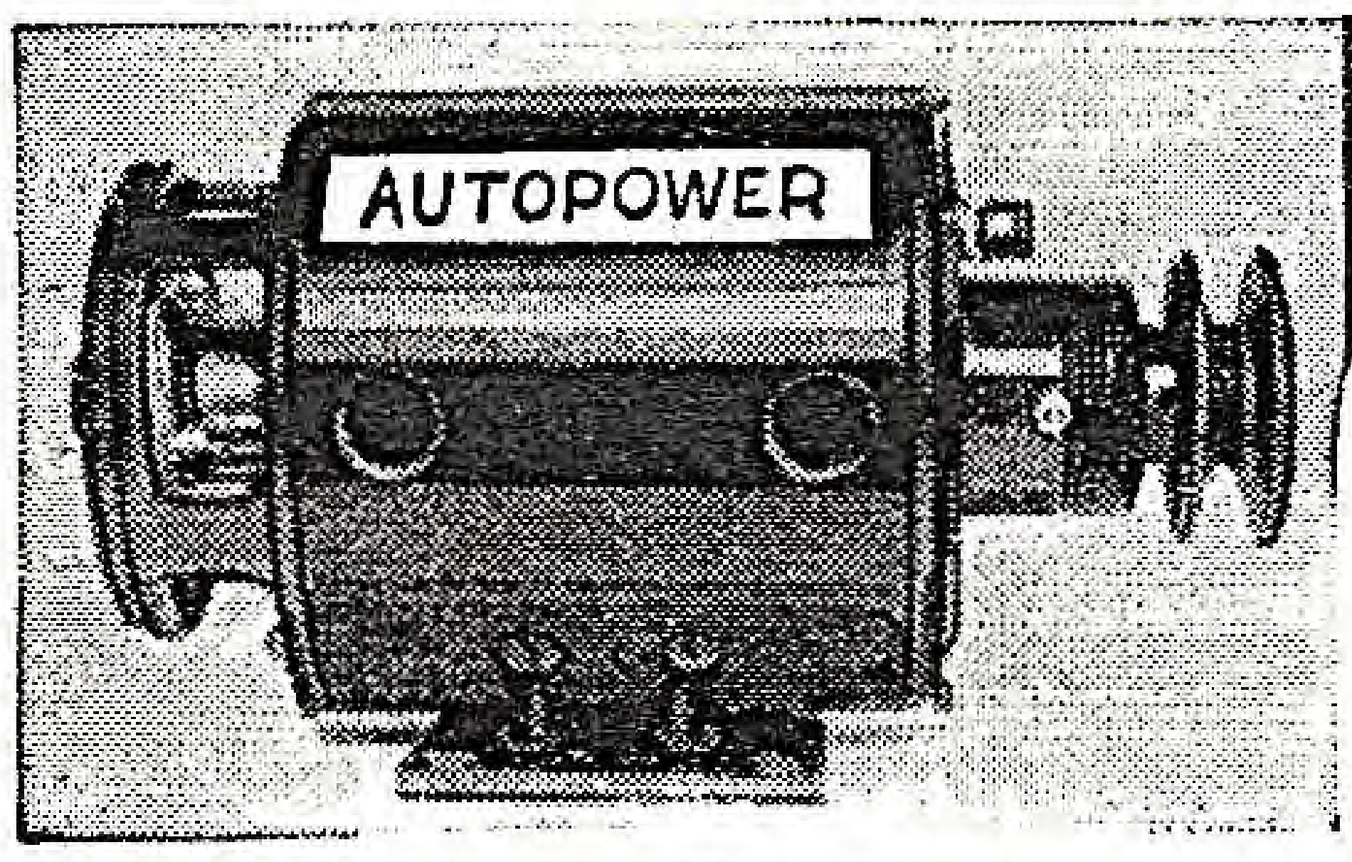

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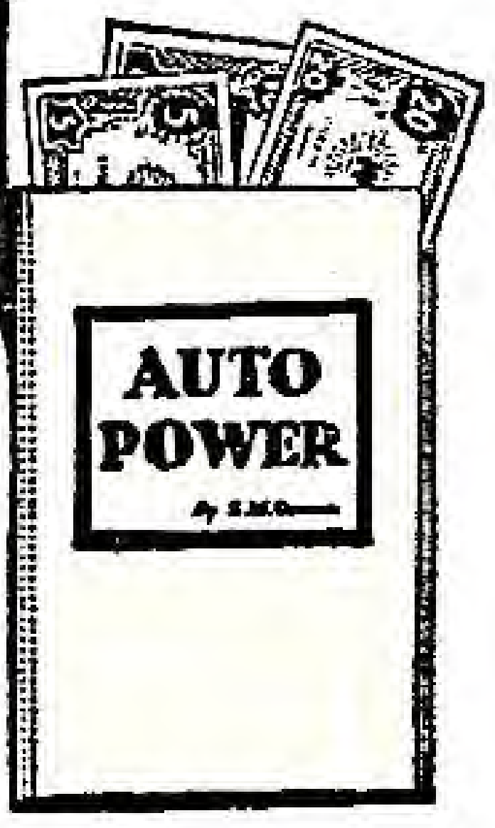

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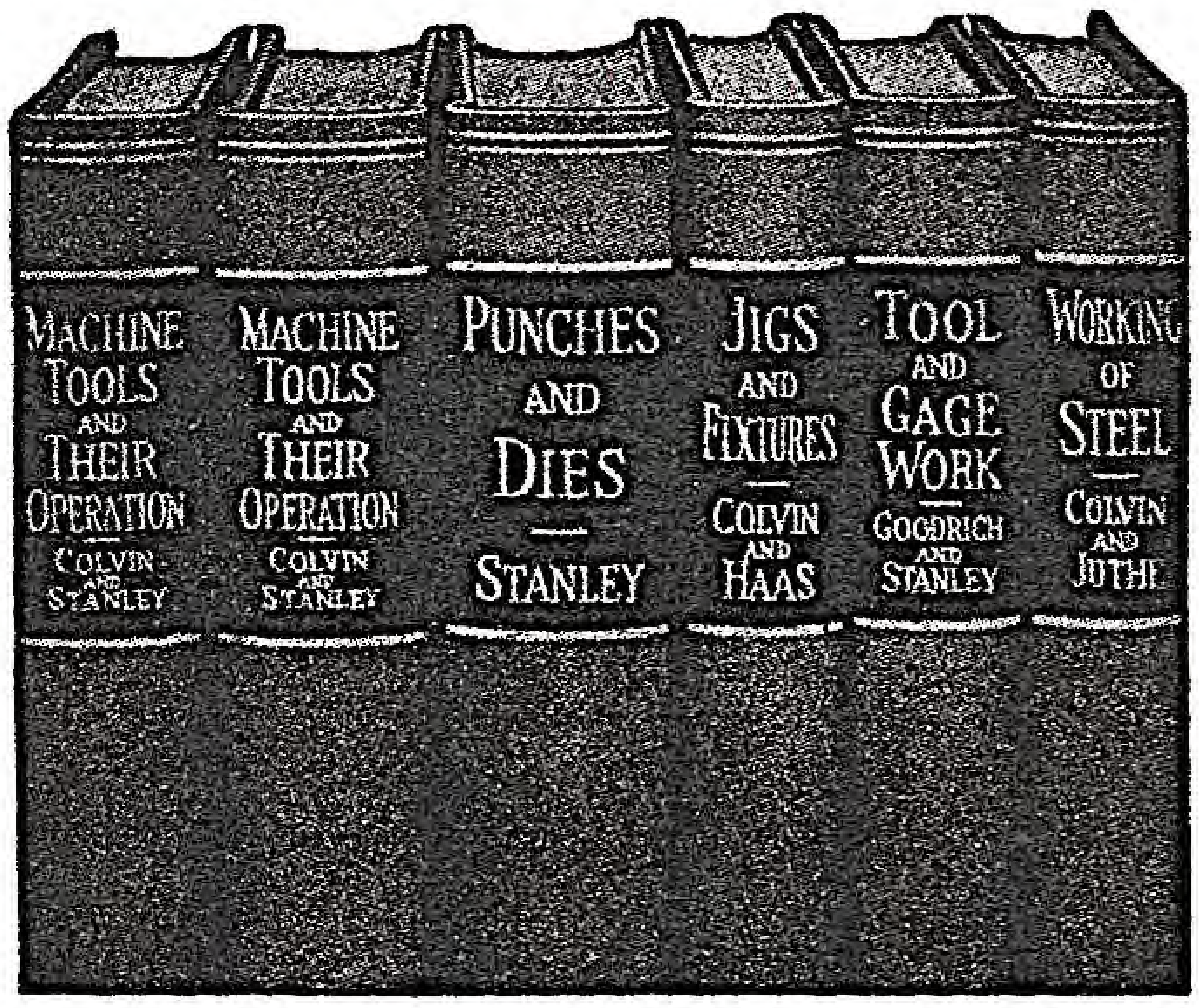
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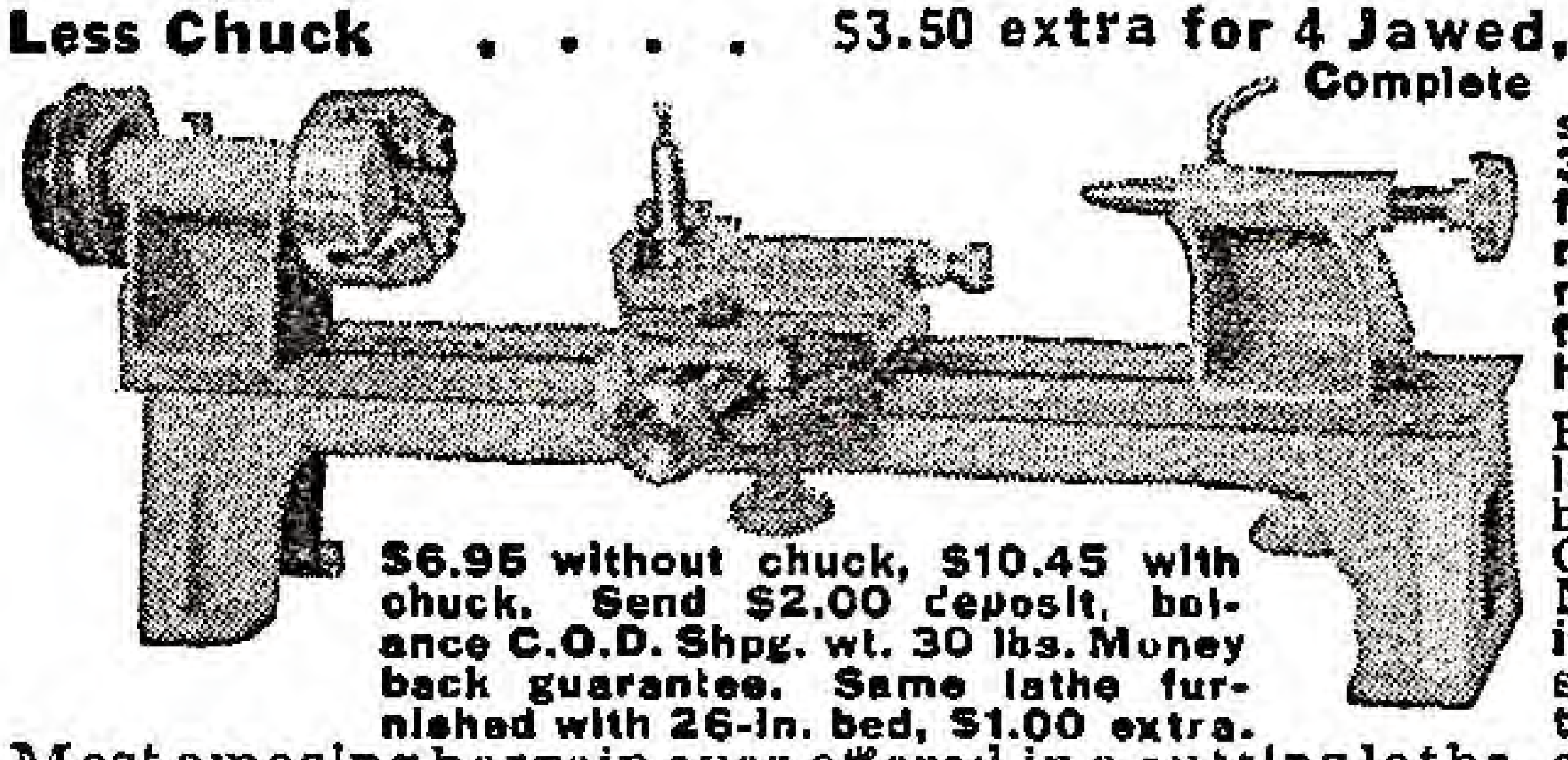

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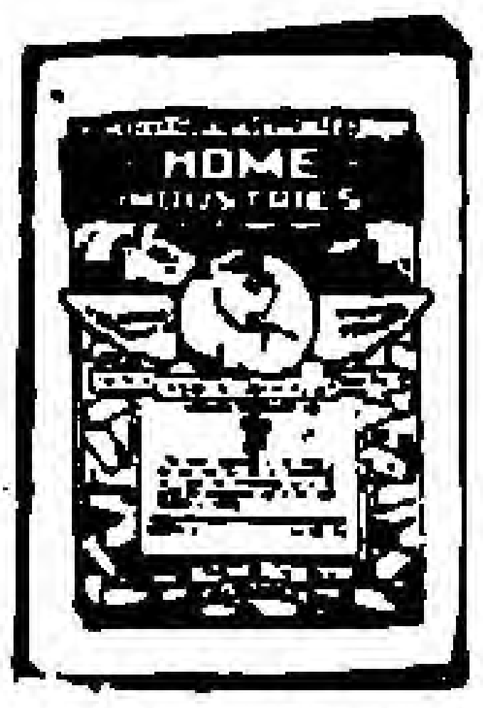

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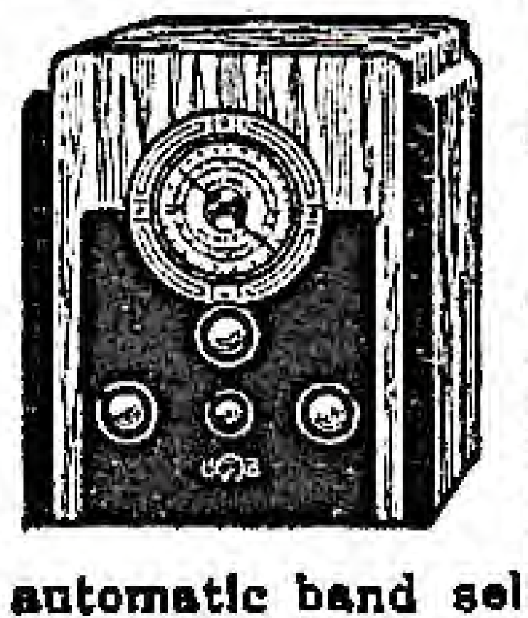

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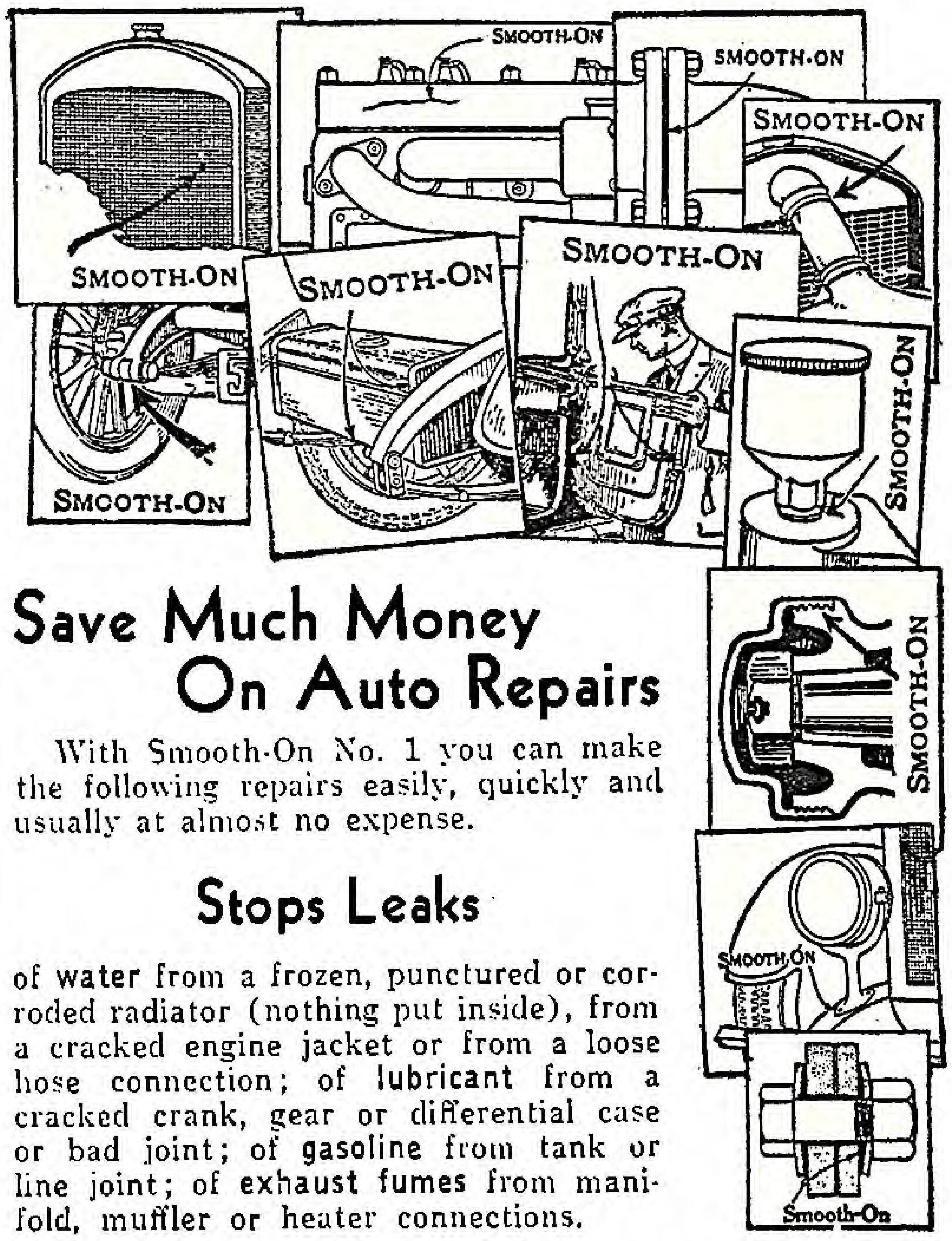

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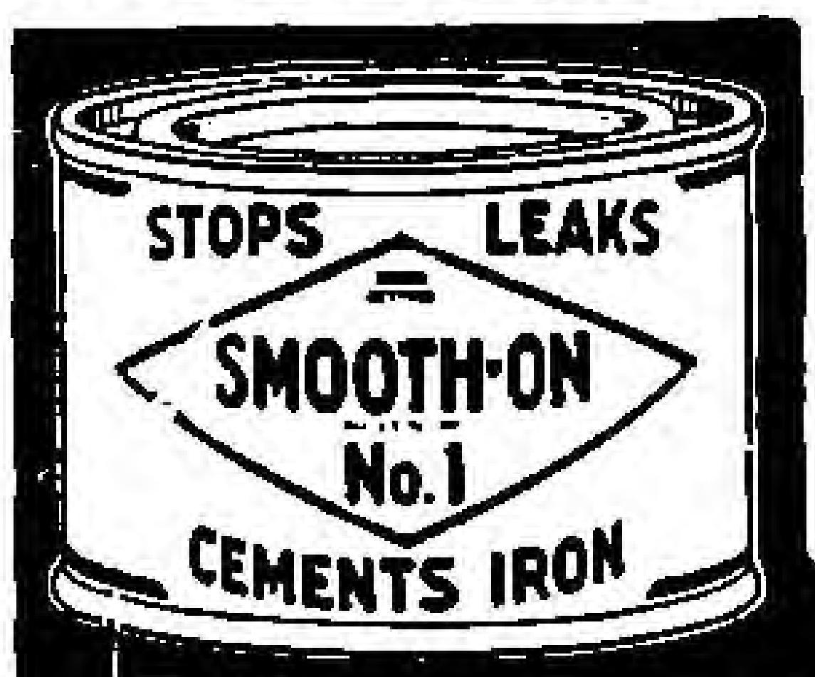

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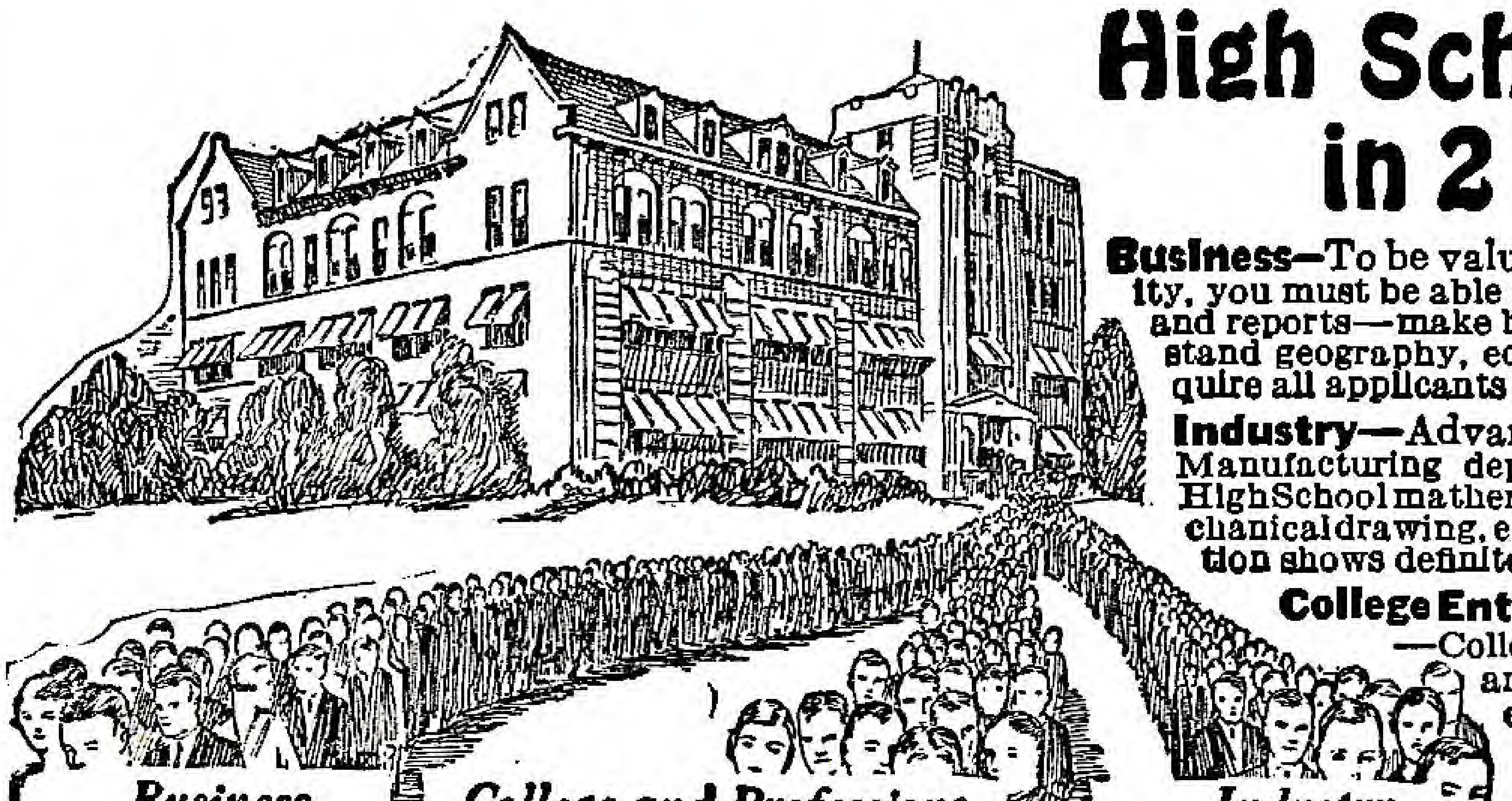

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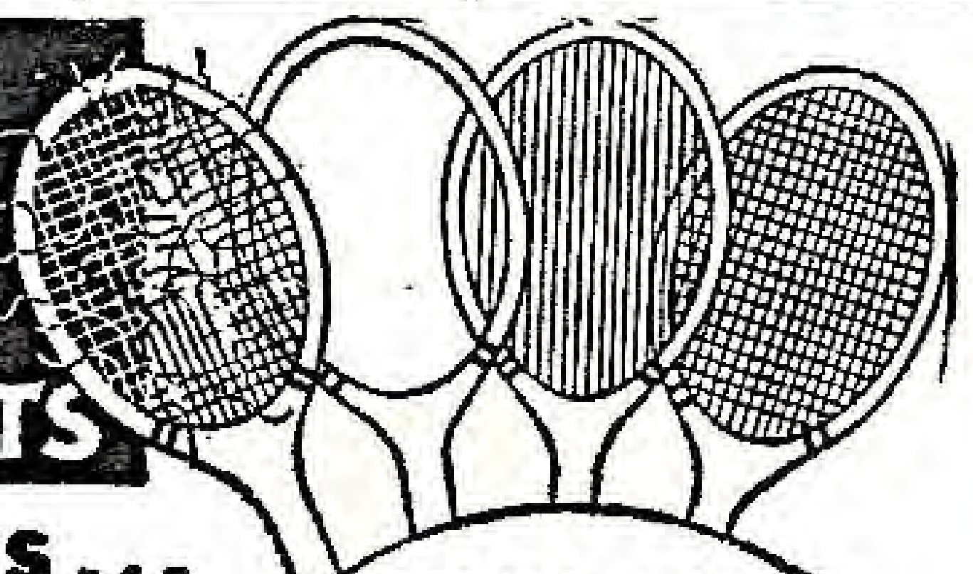

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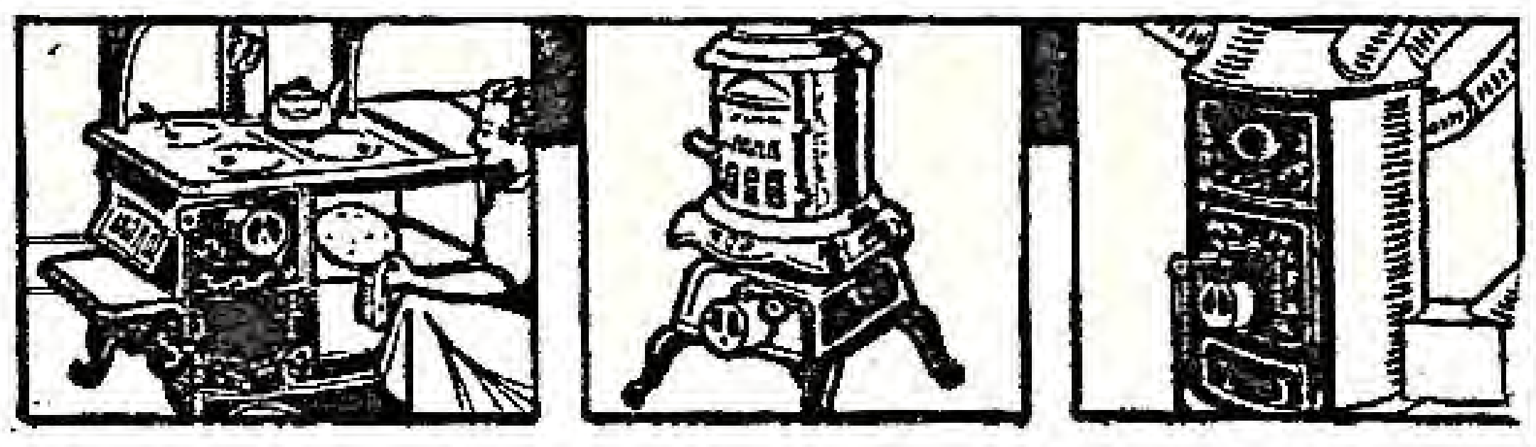

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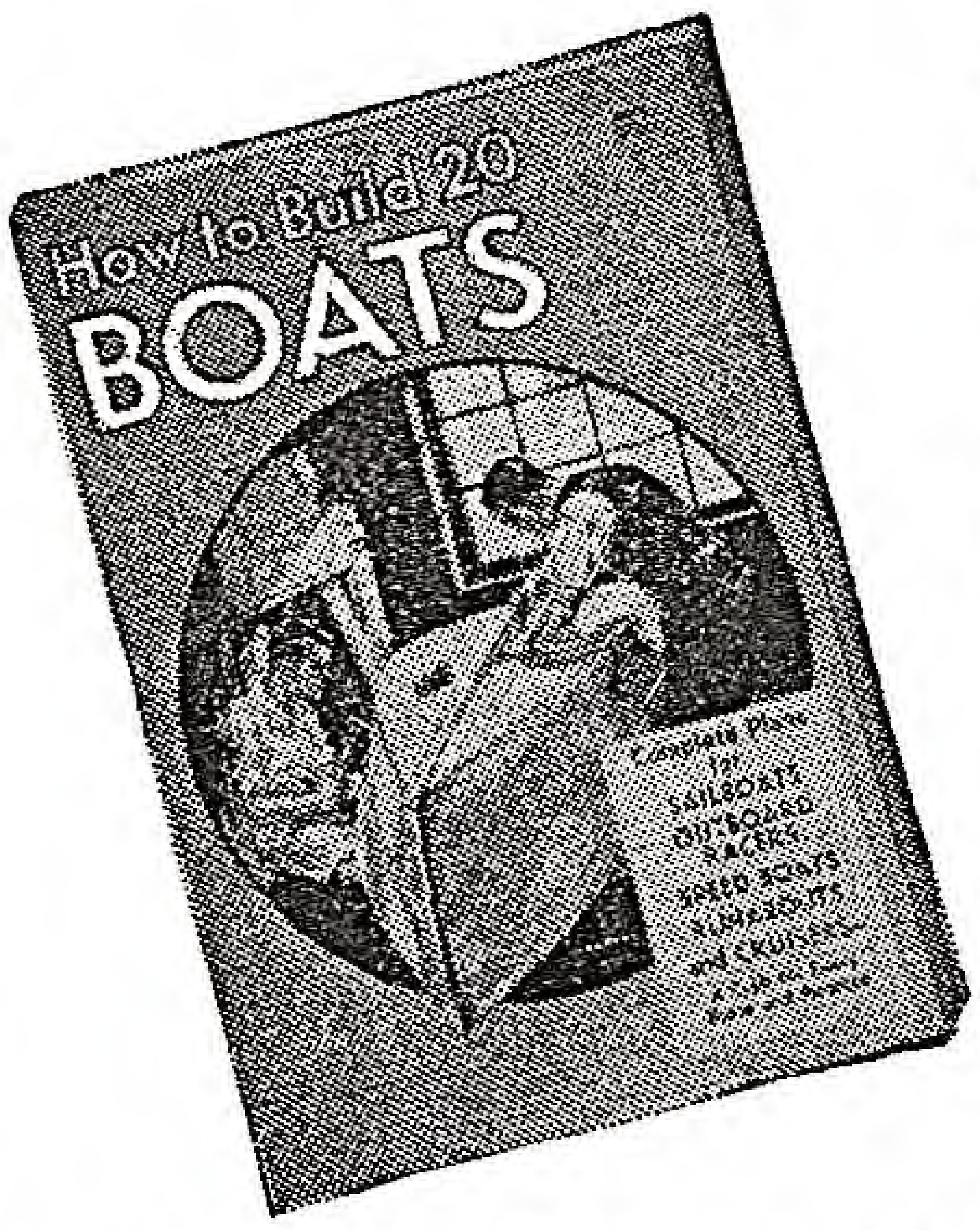

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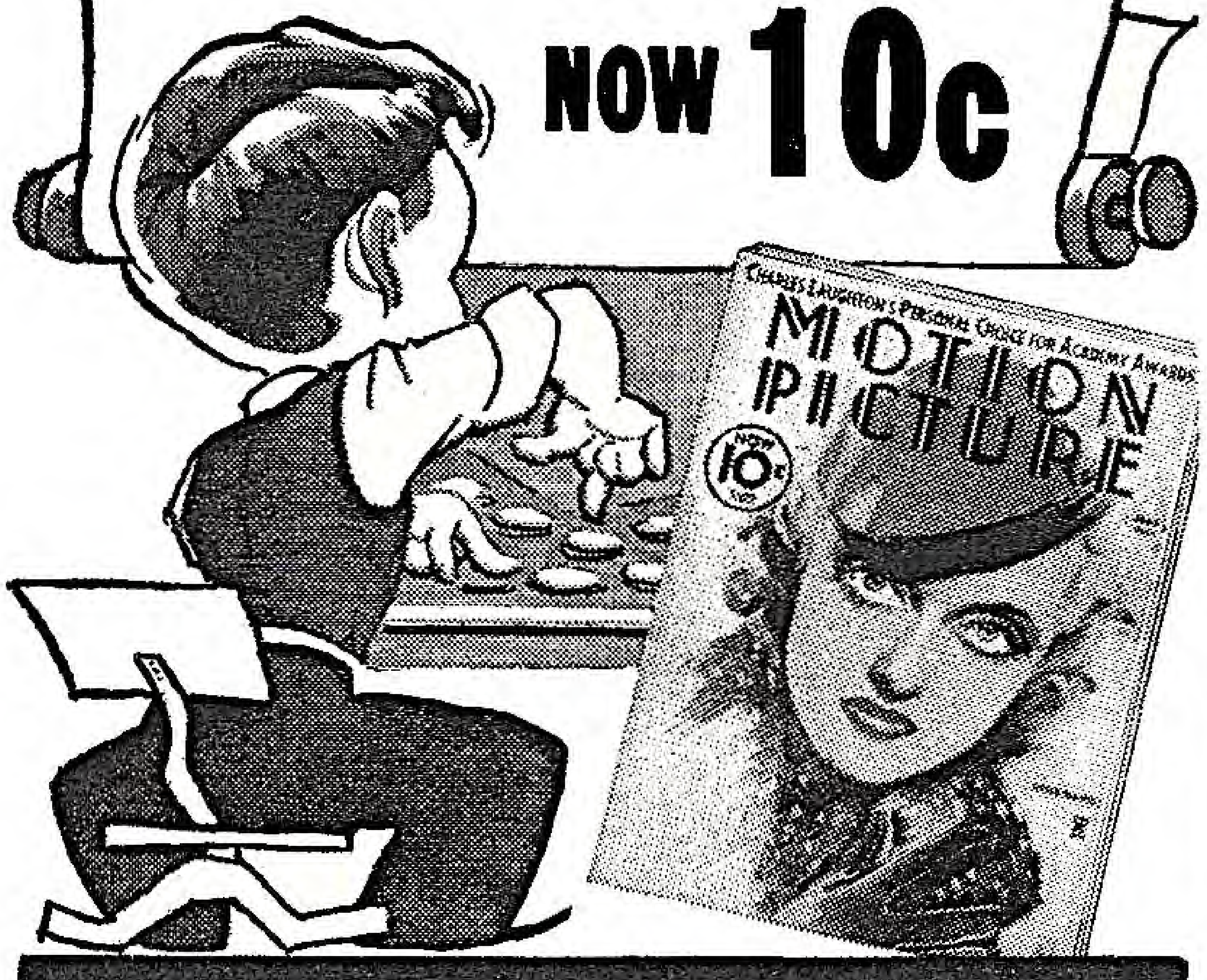
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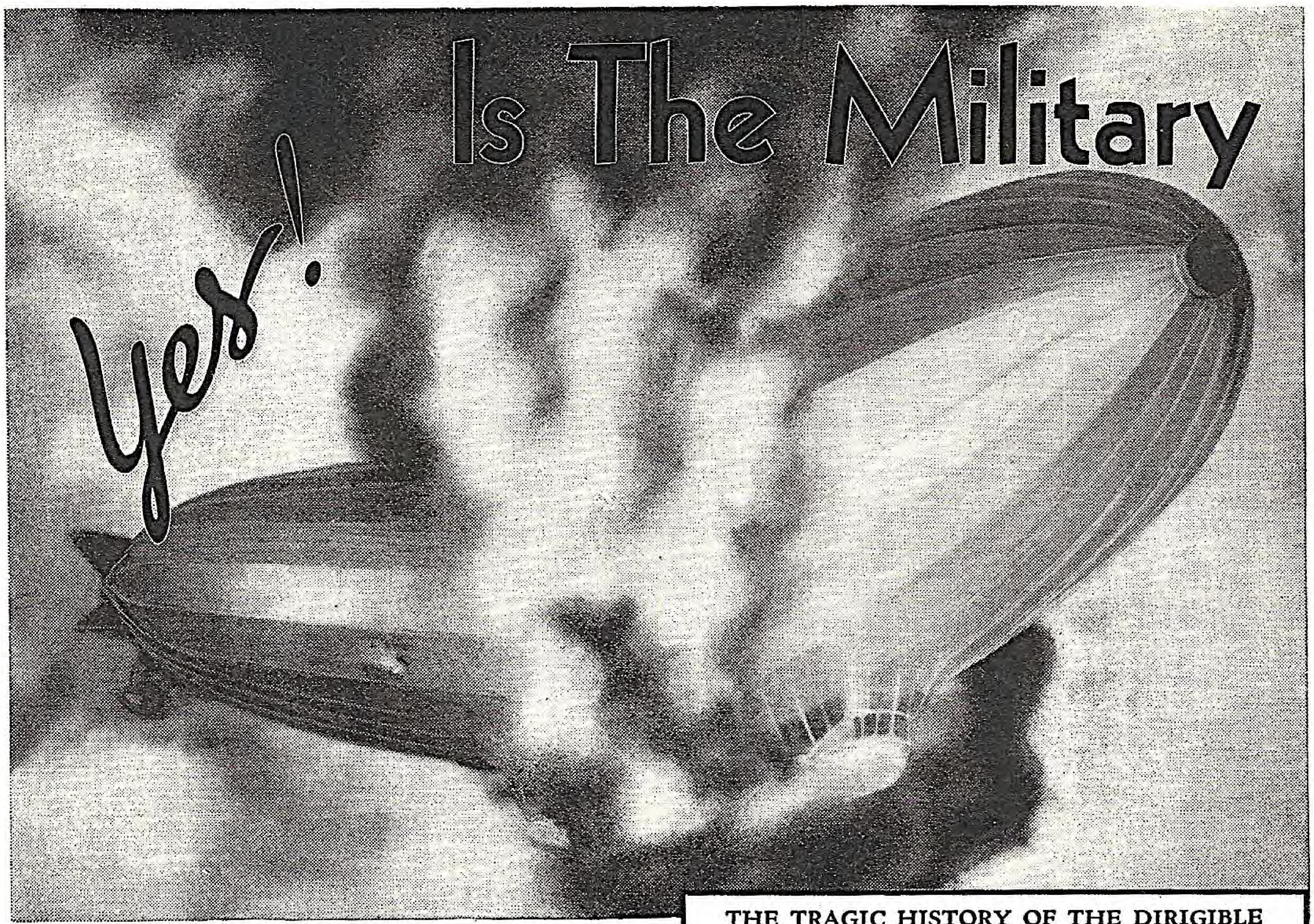


Wing Commander Uhler claims the dirigible is doomed because with hydrogen gas it is a fire hazard. Helium, he says, is not as buoyant, requires larger, dangerous structures.

by

WING COMMANDER S. K. UHLER

Royal Air Force, Great Britain, Retired

Editor's Note: The views and opinions expressed in this article are those of the author and do not necessarily reflect the official views or opinions of the armed forces of His Majesty, the King of England.

SINCE Count Zeppelin built and flew the first large, rigid airship, approximately 150 such lighter-than-air craft have been built and flown. Practically all of them, built by Germany, Great Britain, France and America have exploded in mid-air, burned or crashed with disastrous loss of life. There have been 19 major, peacetime dirigible disasters during the past 23 years. These crashes have wasted 350 lives and a sum of money roughly twenty million pounds ($100,000,000). It would seem the time has come to admit the dirigible a failure, a plaything of the winds and a potential flying mausoleum.

THE TRAGIC HISTORY OF THE DIRIGIBLE

In the last 23 years there have been 19 dirigible disasters with a loss of 350 lives. The destruction of four dirigibles, the Shenandoah, the ZR-2, the Akron, and the Macon, cost the United States a total of $10,825,000 for construction costs alone.

The record of disasters:

Feb. 12, 1935—U. S. Navy dirigible Macon crashed into the Pacific. Two killed.

April 4, 1933—U. S. Akron crashed off New Jersey coast. 73 dead.

Oct. 4, 1930—British R-101 exploded over France. 46 dead.

May 25, 1928—Italian Italia crashed near North Pole. Eight dead.

Sept. 3, 1925—U. S. Shenandoah wrecked in storm over Ohio. 14 killed.

Dec. 21, 1923—French Dixmude crashed into Mediterranean. 52 killed.

Feb. 21, 1922—U. S. Roma burned in flight near Hampton Roads. 34 dead.

Aug. 24, 1921—ZR-2 built in England for U. S., collapsed over Humber River. 42 killed.

Jan. 29, 1921—British R-34 wrecked at Howden, England. No casualties.

July 21, 1919—Dirigible burned over Chicago. 10 killed.

July 5, 1919—British NS-11 destroyed over North Sea. 12 dead.

June 20, 1914—Airship and airplane collided at Vienna. 9 killed.

Sept. 9, 1913—German Zeppelin L-1 destroyed off Heligoland. 15 dead.

Oct. 17, 1913—Zeppelin L-2 exploded over Johannisthal. 28 killed.

July 2, 1912—Balloon Akron exploded at Atlantic City. 5 dead.

Four other peace-time Zeppelins were lost in accidents.

The writer would like to have seen lighter-than-air aviation succeed. I had high hope for it some years ago even when it seemed that every great airship was foredoomed to destruction. My hope rose to new levels when the discovery of helium promised to produce dirigibles free from the perils of fire and explosion. Unfortunately, however, the use of helium has not justified the predictions of lighter-than-air enthusiasts. My hope for ultimate success in lighter-than-air craft has

[*Continued on page* 127]

Dirigible Doomed? No!

The Macon preparing to land at the hangar at Sunnyvale. Destruction of this ship in the Pacific near San Francisco has renewed debate over the value of lighter-than-air craft.

by LIEUTENANT JOHN E. HOGG

U. S. Naval Reserve

Editor's Note: The views and opinions expressed in this article are those of the author and should not be construed as reflecting the official views or opinions of the United States Navy Department.

SOME years ago an American by the name of Holland invented the submarine. The United States recognized its military possibilities but developed a bad case of cold feet after several of Mr. Holland's early, experimental craft submerged permanently. So, we abandoned the submarine, let Germany pioneer the thing, and use it against us to our untold disadvantage in the World War.

As if we had learned nothing by that blunder the future of lighter-than-air craft development now hangs in the balance insofar as the United States is concerned. Because three of the four helium airships we have owned and operated have crashed from structural failures, a considerable demand has arisen that we spend no more money and risk no more lives in the attempted development of a type of aircraft now termed by many—a demonstrated impracticability.

If the mob psychology bred of the Shenandoah, Akron, and Macon disasters leads us to abandon further dirigible development, even temporarily, the results may be far-reaching and inimical to our national hopes and ambitions. We may repeat our mistake with the submarine. Some more far-seeing and less-easily-discouraged nation will undoubtedly carry on from the point where we leave off. To that nation we may surrender future naval supremacy and commercial advantages of incalculable value.

The history of dirigible pioneering has admittedly been disastrous, but there is nothing in it to indicate that successful lighter-than-air craft are impossible of attainment. The use of hydrogen, an explosive gas, as the agent of aerial buoyancy has been responsible for the loss of most of the dirigibles built prior to

[*Continued on page* 127]

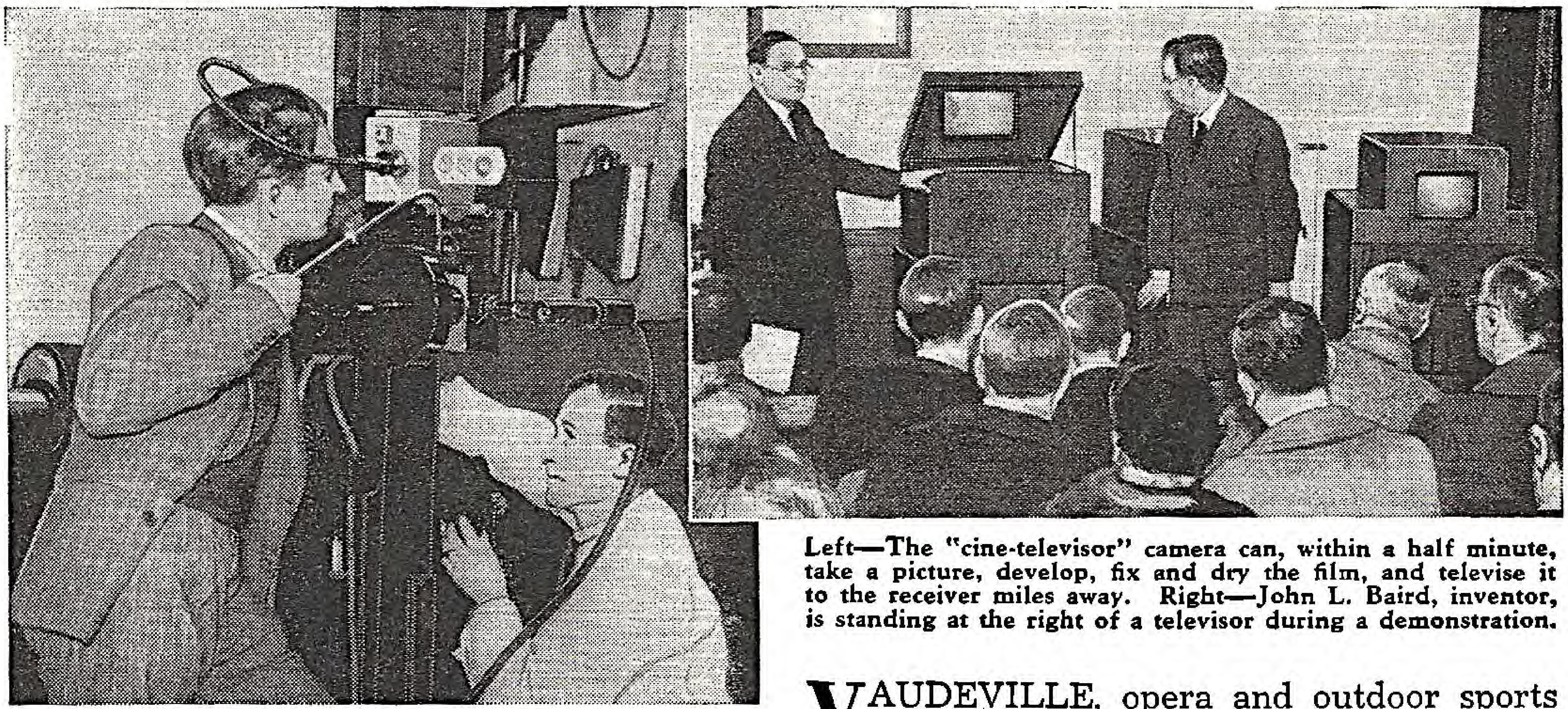
REMARKABLE RECORD OF THE GRAF ZEPPELIN

Under the command of Dr. Hugo Eckener the Graf Zeppelin is in its seventh season of trans-ocean commercial flying this year. It has made 60 crossings of the South Atlantic, seven of the North Atlantic, and one of the Pacific.

The Graf Zeppelin has flown 1,025,271 miles. In 1929 it flew 21,700 miles around the world with 20 passengers in 20 days, 4 hours.

This summer Germany's new dirigible, the LZ-129, the world's largest, will make its maiden flight. Capable of carrying 50 passengers, it may fly the Atlantic to the United States.

England Will Broadcast First Chain Television Programs



Left—The "cine-televisor" camera can, within a half minute, take a picture, develop, fix and dry the film, and televise it to the receiver miles away. Right—John L. Baird, inventor, is standing at the right of a televisor during a demonstration.

VAUDEVILLE, opera and outdoor sports events are predicted to be among some of the feature programs which will be broadcast to British firesides this fall when the first national television network in the world swings into action in Great Britain.

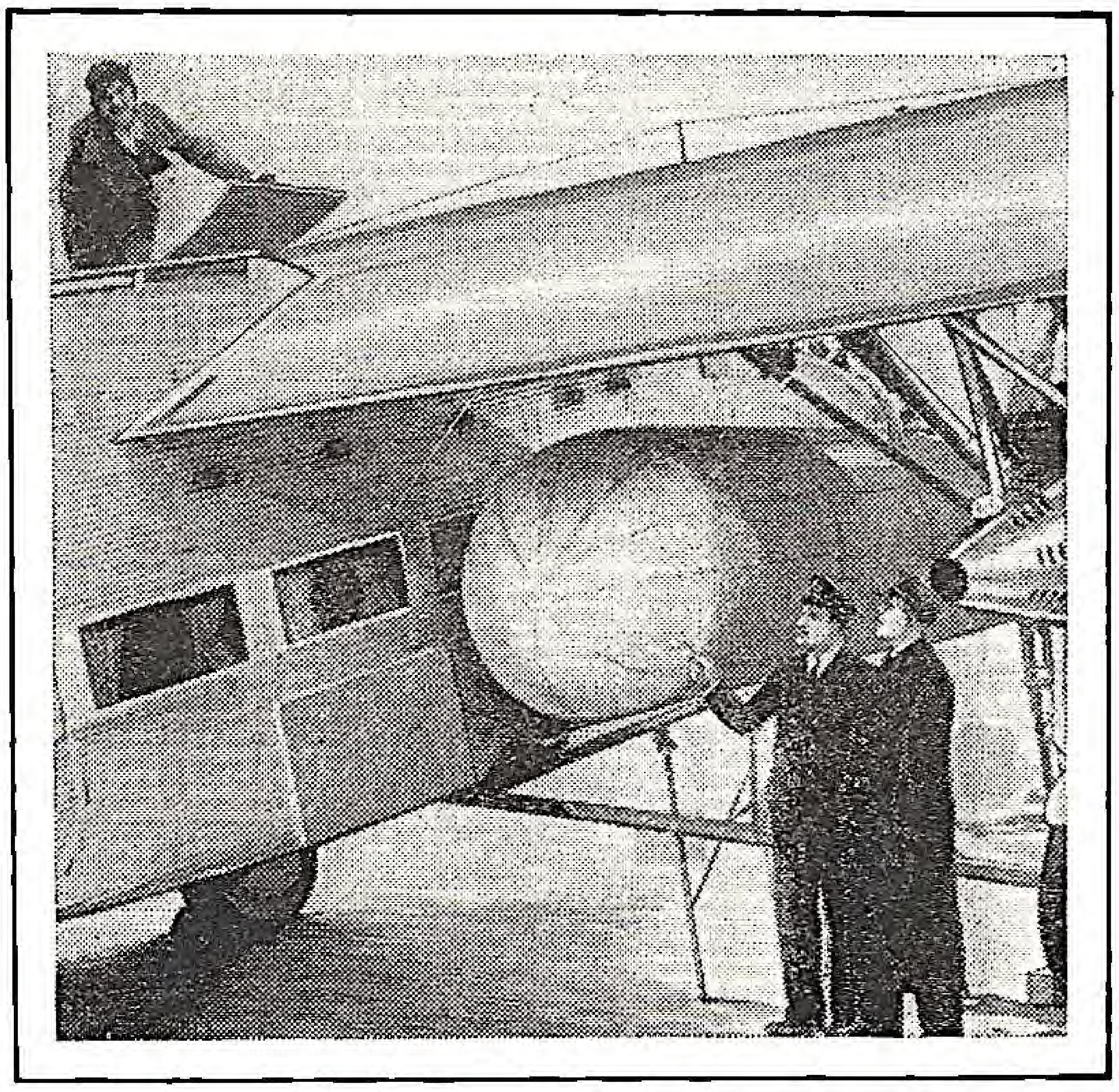
At least ten stations, catering to approximately one-half of the British population, will enable "lookers"—as the new spectator-listener audience is called—to enjoy this novel entertainment. Owing to the distortion of the short waves, reception will be limited to a radius of 25 miles. British engineers, however, still consider their equipment superior to television apparatus used in the United States or Germany.

Receiving sets with 6 by 8-inch screens will sell to the public at $250, but this price is expected to be halved within a year when mass production starts.

Under the new plan, high-definition television broadcasts will replace the present "coarse-grain" offerings. Experimenters claim that projected pictures will be as clear as home movies. A patent pool has been urged to further television.

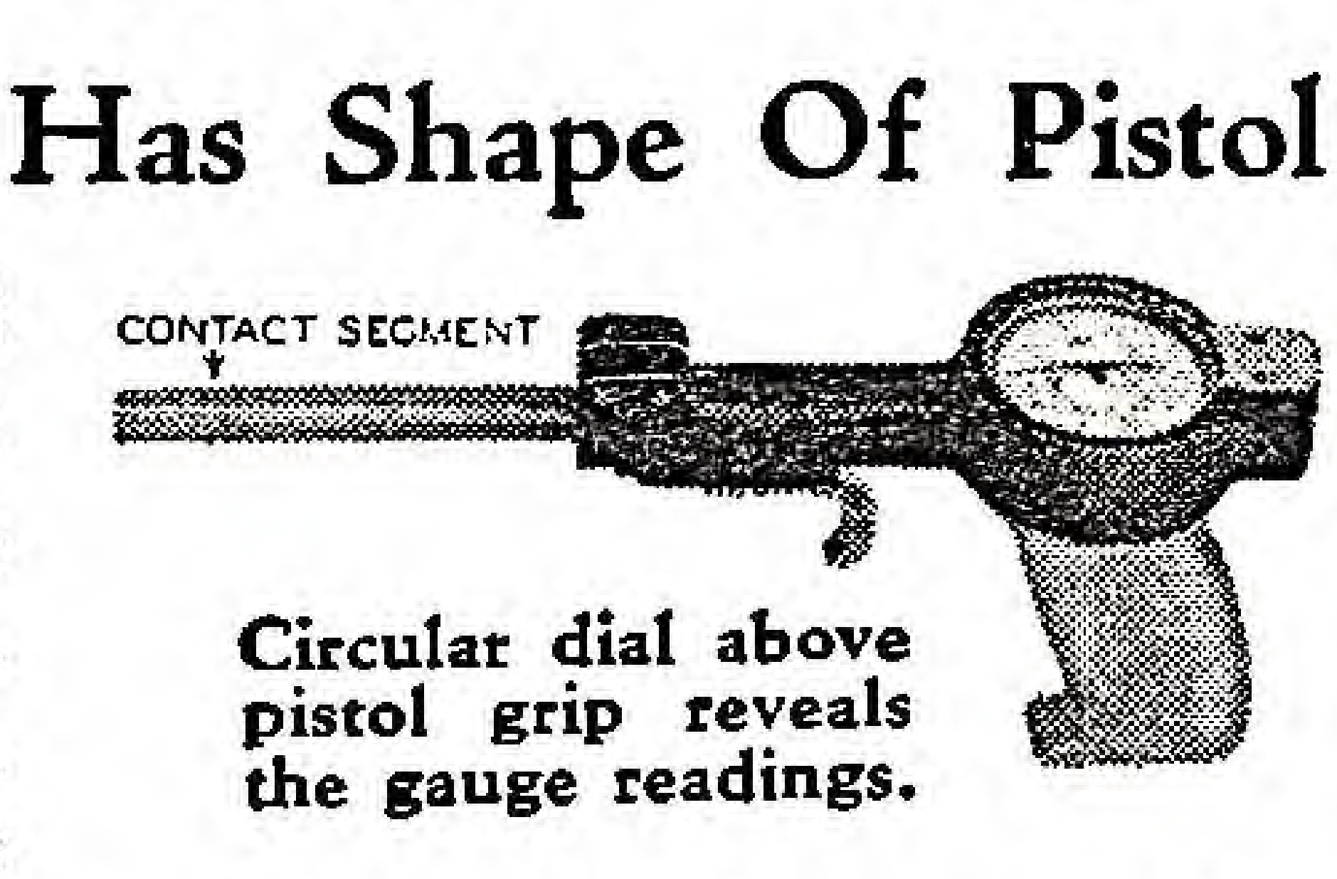
Inflated Bags Keep Plane Afloat

AIR bags, which can be inflated in a few seconds, are fastened to each side of the fuselage of planes used by an eastern air transport company as a safety measure when traveling over water. In the event that the plane is forced down on water, the balloons will keep it afloat for several hours until passengers can be rescued. Should a forced landing on the ocean or one of the Great Lakes be necessary, a trap-door opening in the upper part of the fuselage permits all passengers to climb to the top of the plane's wings. From such a vantage point, they can be saved before the craft sinks.



Planes flying between Detroit and Cleveland carry their own air balloons which may be inflated in case an emergency landing is found necessary on open water.

Hole Gauge Has Shape Of Pistol

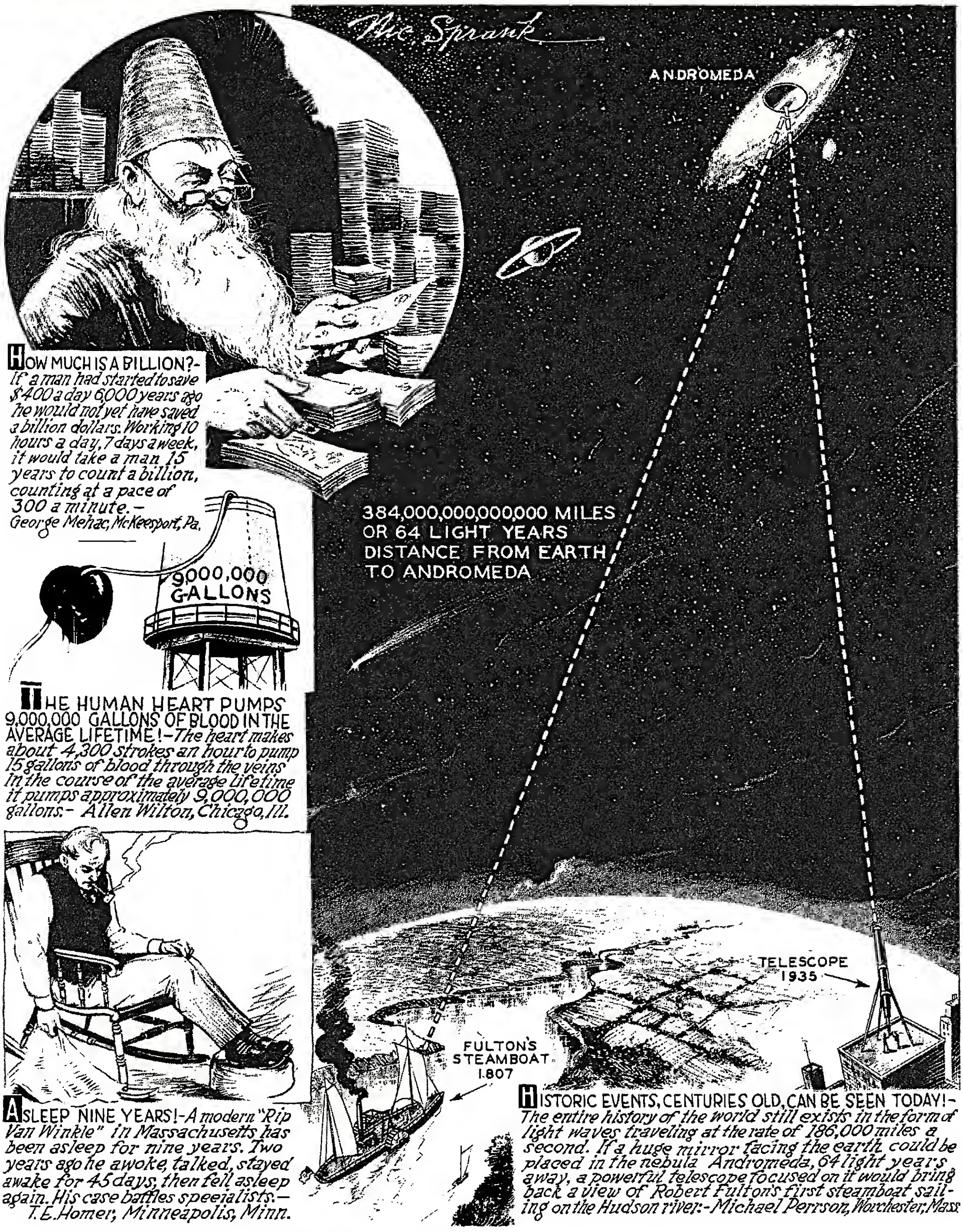


Circular dial above pistol grip reveals the gauge readings.

PISTOL-LIKE in shape, this small-hole gauge measures diameters and also detects out of round, bell round and taper conditions. The gauge plug has a two-point contact dial with micrometer adjustments. Various plugs for different lengths and diameters are instantly interchangeable.

SEE Century Old Events Today

Says Nic Sprank in Oddities of Science


Nic Sprank
ANDROMEDA
384,000,000,000,000 MILES OR 64 LIGHT YEARS DISTANCE FROM EARTH TO ANDROMEDA
9,000,000 GALLONS
TELESCOPE 1935
FULTON'S STEAMBOAT 1807

HOW MUCH IS A BILLION?–*If a man had started to save $400 a day 6,000 years ago he would not yet have saved a billion dollars. Working 10 hours a day, 7 days a week, it would take a man 15 years to count a billion, counting at a pace of 300 a minute.*–*George Mehac, McKeesport, Pa.*

THE HUMAN HEART PUMPS 9,000,000 GALLONS OF BLOOD IN THE AVERAGE LIFETIME!–*The heart makes about 4,300 strokes an hour to pump 15 gallons of blood through the veins. In the course of the average lifetime it pumps approximately 9,000,000 gallons.*–*Allen Wilton, Chicago, Ill.*

ASLEEP NINE YEARS!–*A modern "Rip Van Winkle" in Massachusetts has been asleep for nine years. Two years ago he awoke, talked, stayed awake for 45 days, then fell asleep again. His case baffles specialists.*–*T. E. Homer, Minneapolis, Minn.*

HISTORIC EVENTS, CENTURIES OLD, CAN BE SEEN TODAY!–*The entire history of the world still exists in the form of light waves traveling at the rate of 186,000 miles a second. If a huge mirror facing the earth could be placed in the nebula Andromeda, 64 light years away, a powerful telescope focused on it would bring back a view of Robert Fulton's first steamboat sailing on the Hudson river.*–*Michael Perrson, Worchester, Mass.*

Win $1! Send your Oddity of Science to Nick Sprank, Modern Mechanix and Inventions, 529 South 7th Street, Minneapolis. Source or proof of each Oddity must be given. Send all Oddities separately, not with other manuscripts or letters.

DOES GRASS HOLD Secret of Hidden Power?

YOU want me to say something about research . . .?

Well, before we set out on any such discussion as that, we should have a pretty fair idea what research is. There is a great deal of misconception about the term. People think research is something mysterious, something romantic. They are fooled by the array of test tubes and complicated apparatus they see in a laboratory. They speak of research as something in a class with sorcery.

Nothing could be further from the truth. There is nothing mysterious about research. It is not romantic in the popular sense of the word. The fact is, there's not much difference between a laboratory and a blacksmith shop. The retorts and apparatus of the laboratory are just our anvils on which we shape new ideas into useful things. The word "laboratory" simply means "workshop."

Research, properly understood is not a profession. It is not just a business. It is not a form of magic.

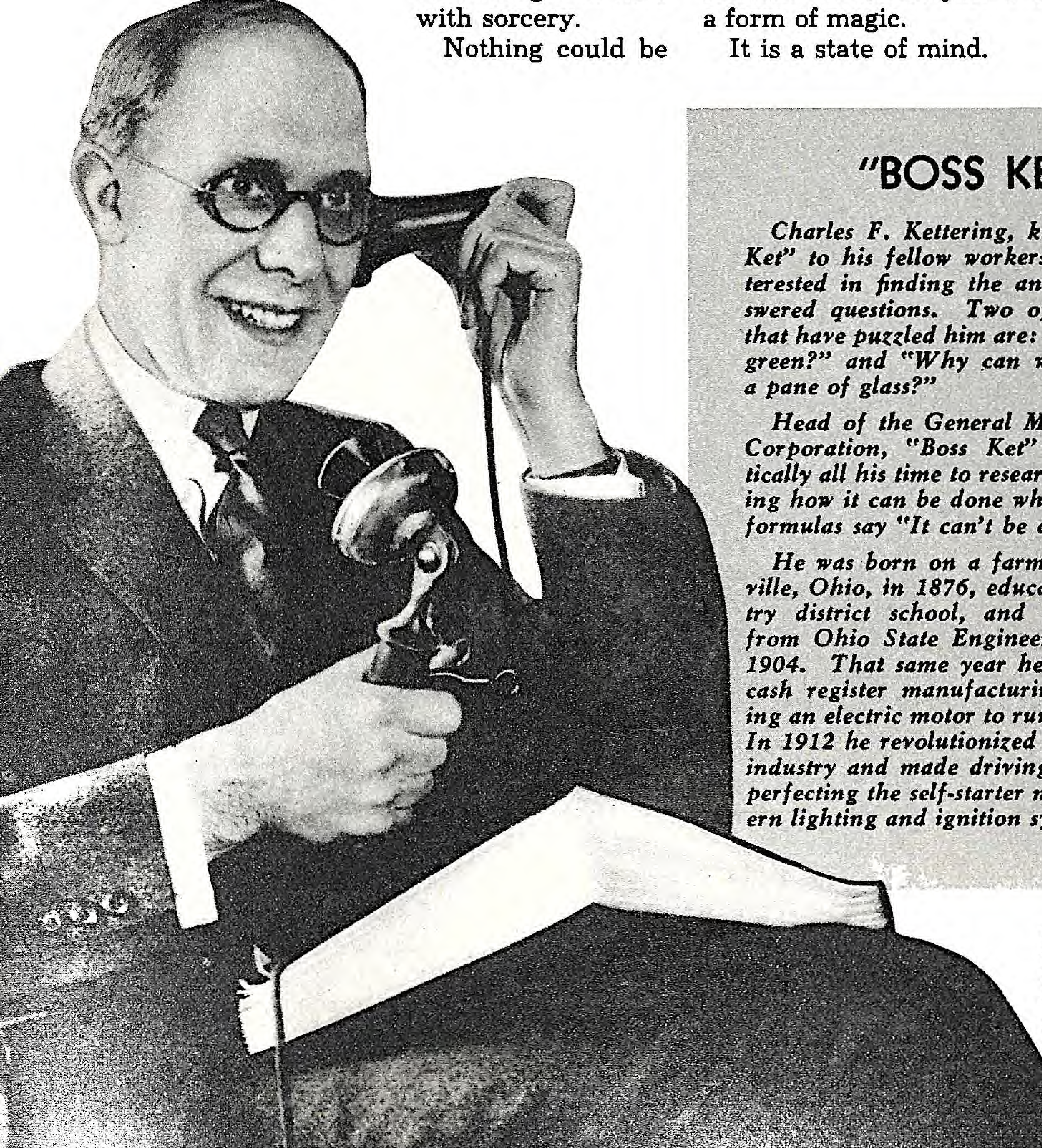
It is a state of mind.

"BOSS KET"

Charles F. Kettering, known as "Boss Ket" to his fellow workers, is chiefly interested in finding the answers to unanswered questions. Two of the foremost that have puzzled him are: "Why is grass green?" and "Why can we see through a pane of glass?"

Head of the General Motors Research Corporation, "Boss Ket" devotes practically all his time to research, to discovering how it can be done when experts and formulas say "It can't be done."

He was born on a farm near Londonville, Ohio, in 1876, educated in a country district school, and was graduated from Ohio State Engineering School in 1904. That same year he revolutionized cash register manufacturing by developing an electric motor to run cash registers. In 1912 he revolutionized the automobile industry and made driving a pleasure by perfecting the self-starter motor and modern lighting and ignition systems.



Left—An informal picture of Kettering at his desk in General Motors Research Laboratories. To him come the problems of the auto industry to be solved by research.

by Charles F. Kettering

VICE PRESIDENT, GENERAL MOTORS CORPORATION
GENERAL DIRECTOR, RESEARCH DIVISION

as reported by PAUL WEBER

I often define research by saying:

Research is trying to find out what you are going to do when you can't do what you are doing now. Research is that habit of thought which causes a man to question established ideas, to preserve an open mind toward new ideas, and to strike out on new and untried paths in persistent search of definite practical objectives, calculated to improve upon natural resources to the general gain of mankind.

Now, all that sounds very complicated and obscure. Let's see if we can put the idea into simpler terms by quoting an example of true research—the career of John W. Hyatt.

John Hyatt was a man who perceived that the world was in need of something. He was not interested in any of the world's great theoretical needs. No, the thing he was interested in was a very humble and compara-

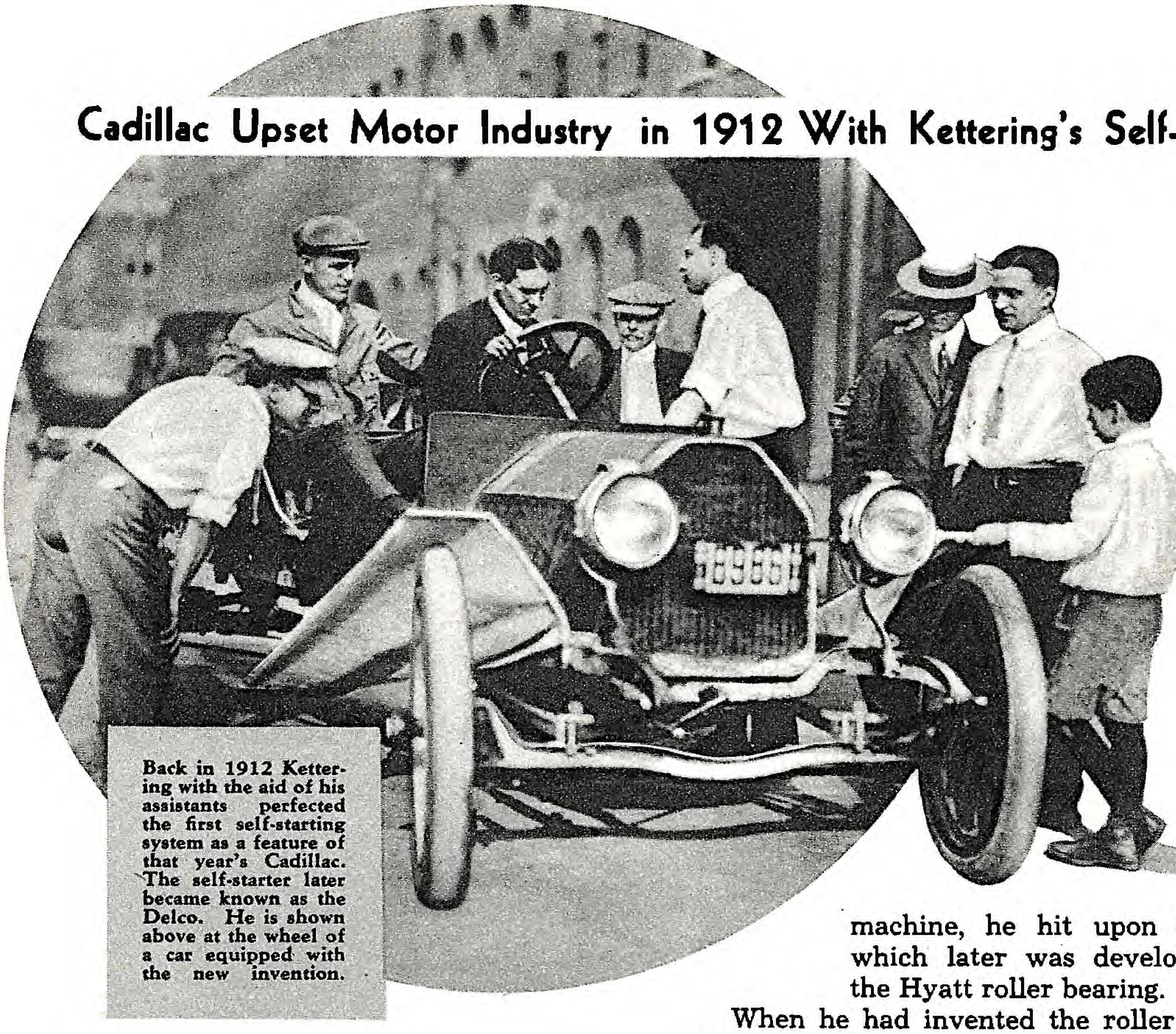
WHY IS GRASS GREEN?

"When men can answer that question thoroughly," says Mr. Kettering in the accompanying article, "they may have achieved something as important as the discovery of fire. For that question involves the whole vast mystery of how nature turns sunlight into energy."

Mr. Kettering gave $577,000 to Antioch college to find the answer to this question, which has been troubling him since his farm boyhood. Dr. P. W. K. Rothemund of Antioch is nearing the solution, having discovered that a colorless substance in plants is converted into chlorophyll, a green substance, when it comes in contact with carbon dioxide.

When the vibrations of traffic near the General Motors laboratories upset delicate instruments during an experiment, Kettering erected a tent on Bell Isle, Detroit's island park. He is shown at the right continuing his experiment.

Cadillac Upset Motor Industry in 1912 With Kettering's Self-Starter



Back in 1912 Kettering with the aid of his assistants perfected the first self-starting system as a feature of that year's Cadillac. The self-starter later became known as the Delco. He is shown above at the wheel of a car equipped with the new invention.

tively unimportant necessity — an artificial billiard ball.

At that time billiard balls were made of real ivory, and this was costly. No material had ever been found which would give the same results as natural ivory, at a cost within the reach of thousands of people who wanted cheap billiard balls. Mr. Hyatt entered a contest for a prize offered for a good artificial ivory.

His quest for artificial ivory led him into a study of the rolling and bouncing qualities of balls made of various materials. One time he was called upon to make repairs on a machine for crushing sugar cane. And from his study of billiard balls and his work on the machine, he hit upon the idea which later was developed into the Hyatt roller bearing.

When he had invented the roller bearing, he returned to his original quest. Again, he sought an artificial ivory. And soon he stumbled upon a substance which he developed into celluloid.

He went further and invented a new type of camera film. Minor achievements followed along the way, but still Hyatt refused to be turned aside from his first objective—an artificial ivory billiard ball.

Year after year he worked. Finally, toward the close of his life he found the right material.

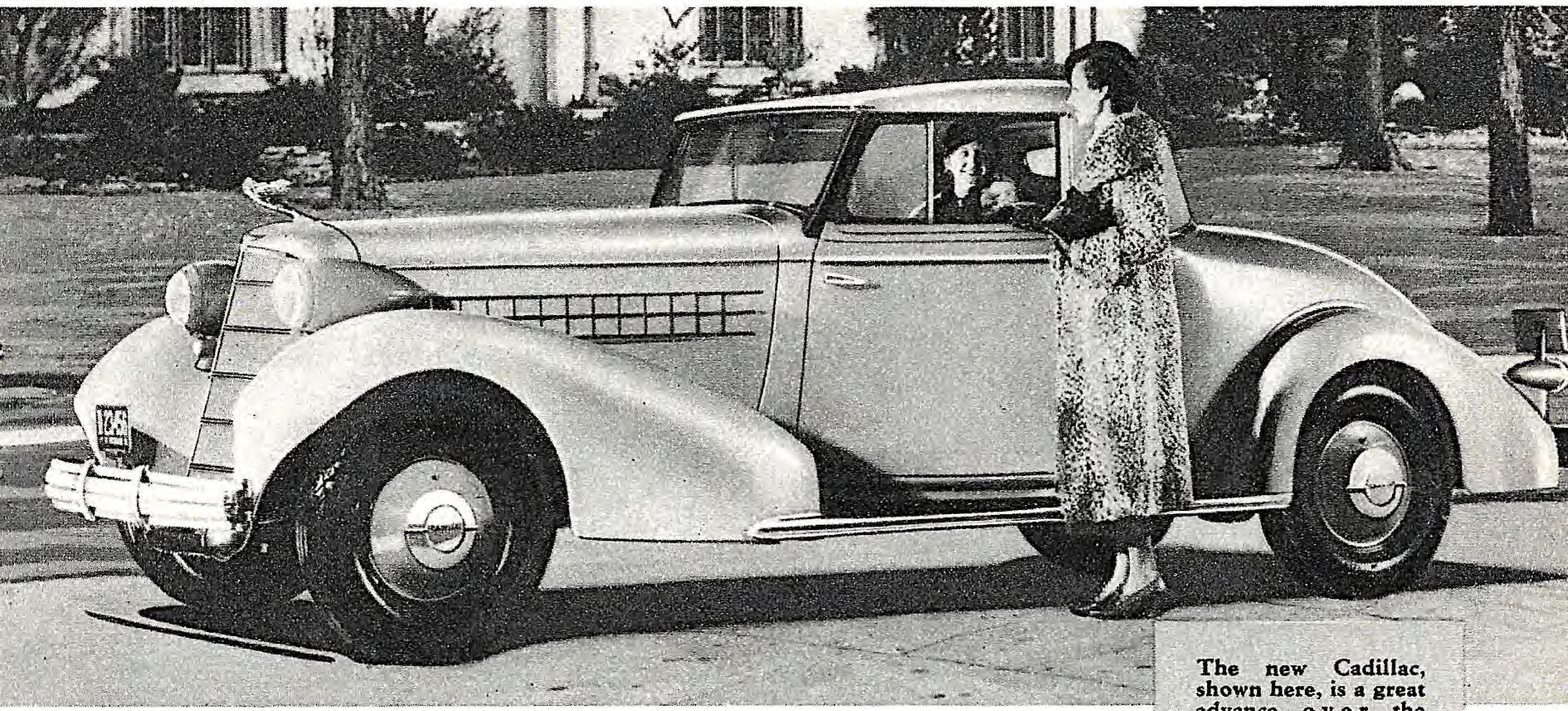
In his quest for this comparatively trivial improvement upon nature, John Hyatt had given life to new industries employing thousands of workers, and had invented new products of real importance to the world.

The story of John W. Hyatt exemplifies the

What is Research?

"Research is a state of mind," declares Mr. Kettering. "Research is trying to find out what you are going to do when you can't do what you are doing now. Research is that habit of thought which causes a man to question established ideas, to preserve an open mind toward new ideas, and to strike out on new and untried paths in persistent search of definite practical objectives, calculated to improve upon natural resources to the general gain of mankind."

Strong Arms Had to Crank Old Autos; Today a Button Starts a Car



The new Cadillac, shown here, is a great advance over the early model car on the opposite page. The modern car starts by merely pressing a button with the hand or foot, making driving a pleasure for women as well as men in good or bad weather.

chief characteristics of true research. First of all, research is always open-minded. It forces ideas to stand upon their own feet. It refuses to accept established ideas on the sole grounds that they are established. And it likewise refuses to condemn new ideas simply because they are new. It insists upon valuing all ideas at their intrinsic worth.

When Hyatt began his life-long adventure in research the idea prevailed that only ivory could be used for billiard balls. But Hyatt refused to honor this belief merely because of its venerable age. This "open-mindedness" is identical with what is sometimes called the "scientific spirit." It is the spirit in which all progress, from the beginning of the world, has been made.

Industrial research must also be practical. It can not be isolated from life. When you strike out in search of some improvement upon nature, you must be sure that it is an improvement which somebody will want.

Millions of dollars have been wasted developing doomed ideas because their originators failed to consider the wants and needs of the other human beings who were to use their products. For example, a few years ago, America had a rash of "cycle cars." A little group of automobile men jumped at the conclusion that because small, inexpensive, low-powered automobiles were popular in some parts of Europe, they would be welcome in the United States. They set out to revolutionize the automobile industry. And they failed.

If they had stopped to ask themselves "Who will want this kind of car?" they would never have made their venture. The truth is that very few people could be persuaded to buy the midget cars. The public did not want economy at the sacrifice of power, beauty, strength and the capacity to travel long dis-

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To Succeed Stay Young

"You must actually keep young—if you would succeed at modern research. When you were born, everybody in the world was older than you. Before you were a year old, there were more than two million people in the world younger than you. At 50 you are older than almost nine-tenths of your fellow human beings. When you have reached an age of maturity, the product you turn out is going to be used mainly by younger people than yourself. Youth dominates industry, art, and commerce, and it rules research."

"Ket" Warns of Dangers of Standardization

"Boss Ket" at work seeking new ideas. He insists civilization cannot be standardized.

tances in comfort. People wanted bigger cars, roomier cars, more rugged cars.

A third main characteristic of true research is its tenacity of purpose. True research sets out with a definite objective and follows that objective to the end. No matter what discoveries it may make along the way, it refuses to be permanently diverted from the original objective. Like John Hyatt searching for his artificial billiard ball, the true research engineer never gives up.

There is another essential of research which may sound strange to you. But when I describe it as an "essential" of research I choose that word deliberately.

Research must keep in touch with youth.

The spirit of research is essentially a youthful spirit. It is, after all, the same spirit (tempered by reason of course) which prompts the small child to make a personal test of the established idea that a hot stove must not be touched. It is the fresh, questioning, hopeful spirit of youth.

That is one reason why you must keep in touch with youth—why you must actually *keep young*—if you would succeed at modern research. But there is an additional and even more important reason why the research engineer must keep in touch with youth. And this reason has to do with the necessity of being practical.

When you were born, everybody in the world was older than you. Before you were a year old, there were more than two million people in the world younger than you. This ratio increases progressively. At 25, half the people in the world are younger than you. At 50 you are older than almost nine-tenths of your fellow human beings. You can see for yourself that when you have reached an age of maturity the product you turn out is going to be used mainly by people younger than yourself. And any research goal, therefore, must be chosen in reference to the wants and necessities of younger people. Youth dominates industry, art, and commerce, and it rules research.

This requirement in the true research engineer is particularly difficult to maintain, because it is human nature to let our thoughts fall into grooves. When a man gets along toward middle age, his ideas are apt to crystallize. The older he gets the more people he

Development of Diesel Engines Will Lower Transportation Costs

finds in the world whose ideas and habits are strange to him. As a sort of unconscious defense mechanism, he persuades himself that the old way (his way) of doing things is the only right way. He closes his mind to new ideas. If he's in any business where success depends upon pleasing large masses of people, he fails.

I make a very strong personal effort to keep in touch with younger minds. I think it is a good thing to drop false dignity sometimes and come in contact with youth on an equal footing.

In the General Motors laboratories, we have many young men and many older men. The young men give us new ideas and fresh slants on our problems. The older men contribute wisdom and the judgment born of experience. Neither group could get along very well without the other.

The old days of the professional inventor are past. The modern research engineer is a vastly different person. We no longer have inventors in our shops just to invent whatever they happen to think of. Invention has become a complex thing, a matter of team work among many men, rather than genius on the part of one. Chemists, metallurgists, engineers, mathematicians and physicists must all contribute their knowledge. Even the simplest of our problems demands the cooperative work of many minds.

The importance of invention to economic welfare is something which men began to realize only when the recent depression struck the world. I am no business man. I am a mechanic. But I believe that lack of new ideas, refusal to accept new ideas and the assumption that our civilization was a finished job, were major causes of the depression.

There were other causes, too, of course—unwise foreign loans, trade barriers between nations, and speculation, for example. But a big cause—and a peculiarly American cause—of the depression was standardization of ideas.

People found the prosperity of the 20's so good that they refused to go forward for fear of losing it. They fitted products into the groove of mass production so solidly that the products could not change in response to human needs.

The whole thing was based on a fallacy—the fallacy that people want standardization.

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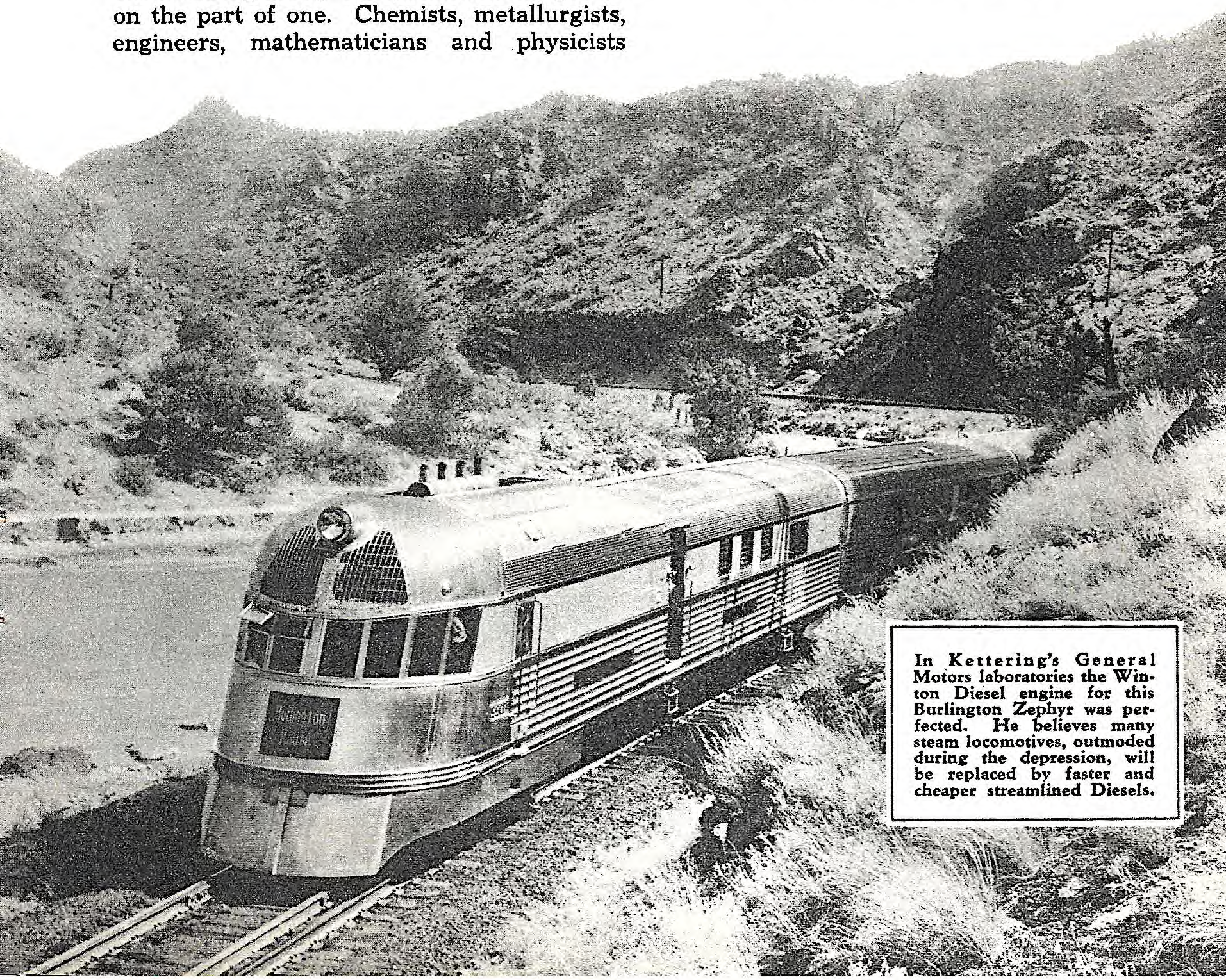
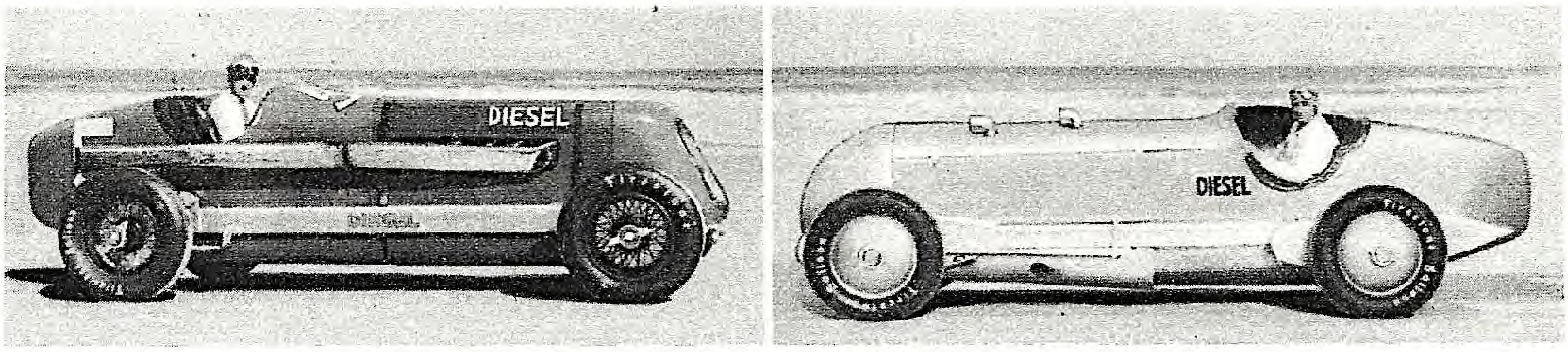


In Kettering's General Motors laboratories the Winton Diesel engine for this Burlington Zephyr was perfected. He believes many steam locomotives, outmoded during the depression, will be replaced by faster and cheaper streamlined Diesels.

DIESEL RACER SETS NEW SPEED RECORD



Left—Bill Cummings, shown at the wheel of his Diesel racer, recently broke a world's record at Daytona Beach. Right—Dave Evans, piloting the "Silver Comet." Both use Diesel fuel oil which gives more miles per gallon at half the cost.

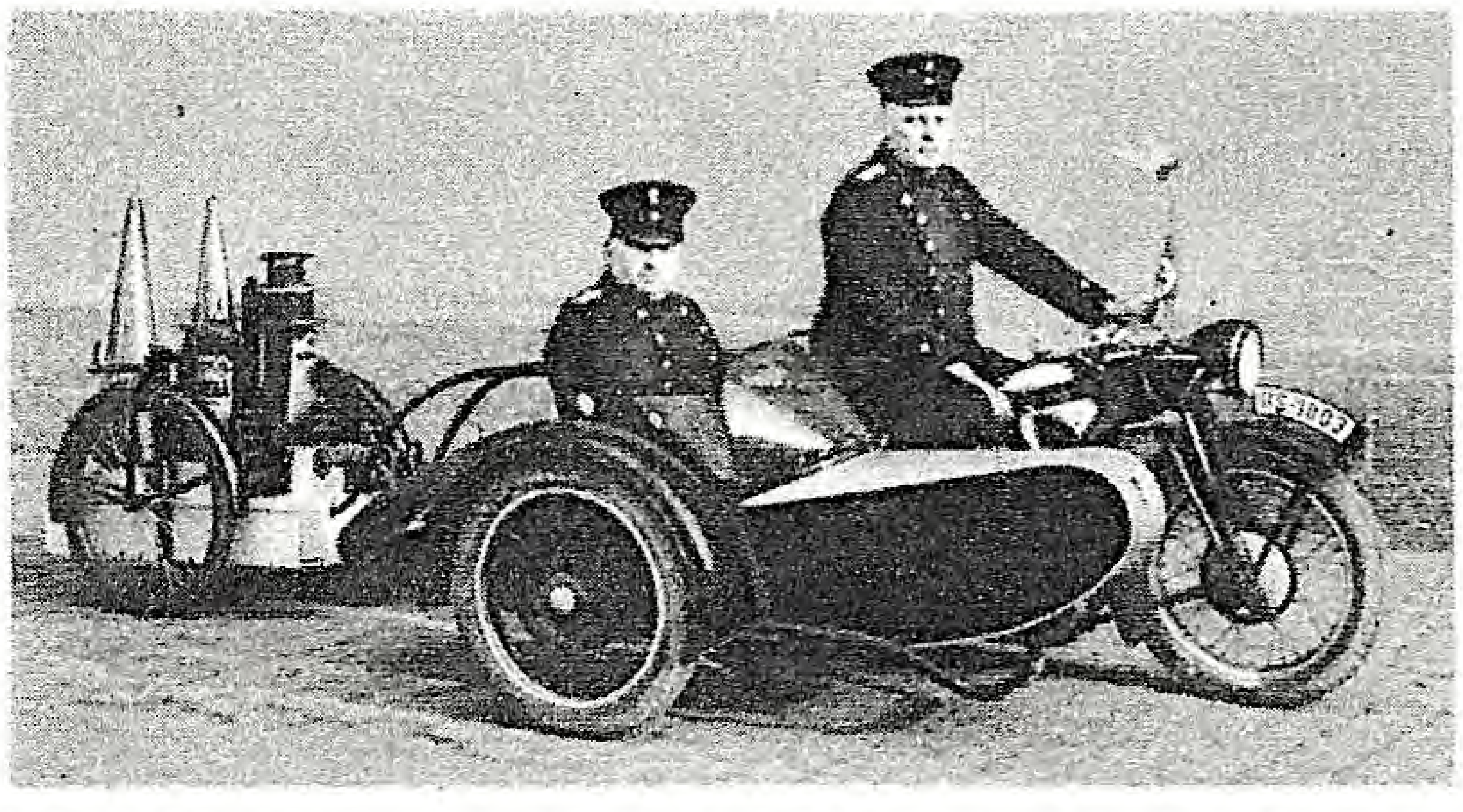
TWO-MILE-A-MINUTE "oil buggies," burning up the sands at Daytona Beach, smashed all previous Diesel-automobile records and proved their worth among the world's best racing cars.

Dave Evans and Bill Cummings, rival speedsters, made every effort to outdo each other. Cummings, handling a racer built by C. L. Cummins, recently drove 137.195 m. p. h. to set a new world's record. On a previous day, Evans roared down the beach with his 150 h. p. six-cylinder job at a speed of 125 m. p. h. which mark Cummings has eclipsed.

Each driver is confident that his particular car has a potential speed of at least 150 m. p. h. The secret of Diesel performance is the cracking of oil by application of heat.

Midget Fire Engine Fits Trailer

A VEST-POCKET fire apparatus is being used by the fire brigade of the small German town of Ansbach. The midget equipment is so light and portable that it can be carried in a trailer behind a three-wheeled motorcycle which rushes quickly to the scene of a fire. The extinguisher is claimed to be unusually efficient. Several important fires already have been put out.



The fire department in a small German community uses the tiny apparatus, shown above, to smother its local blazes.

New A. C. Motor Has D. C. Features

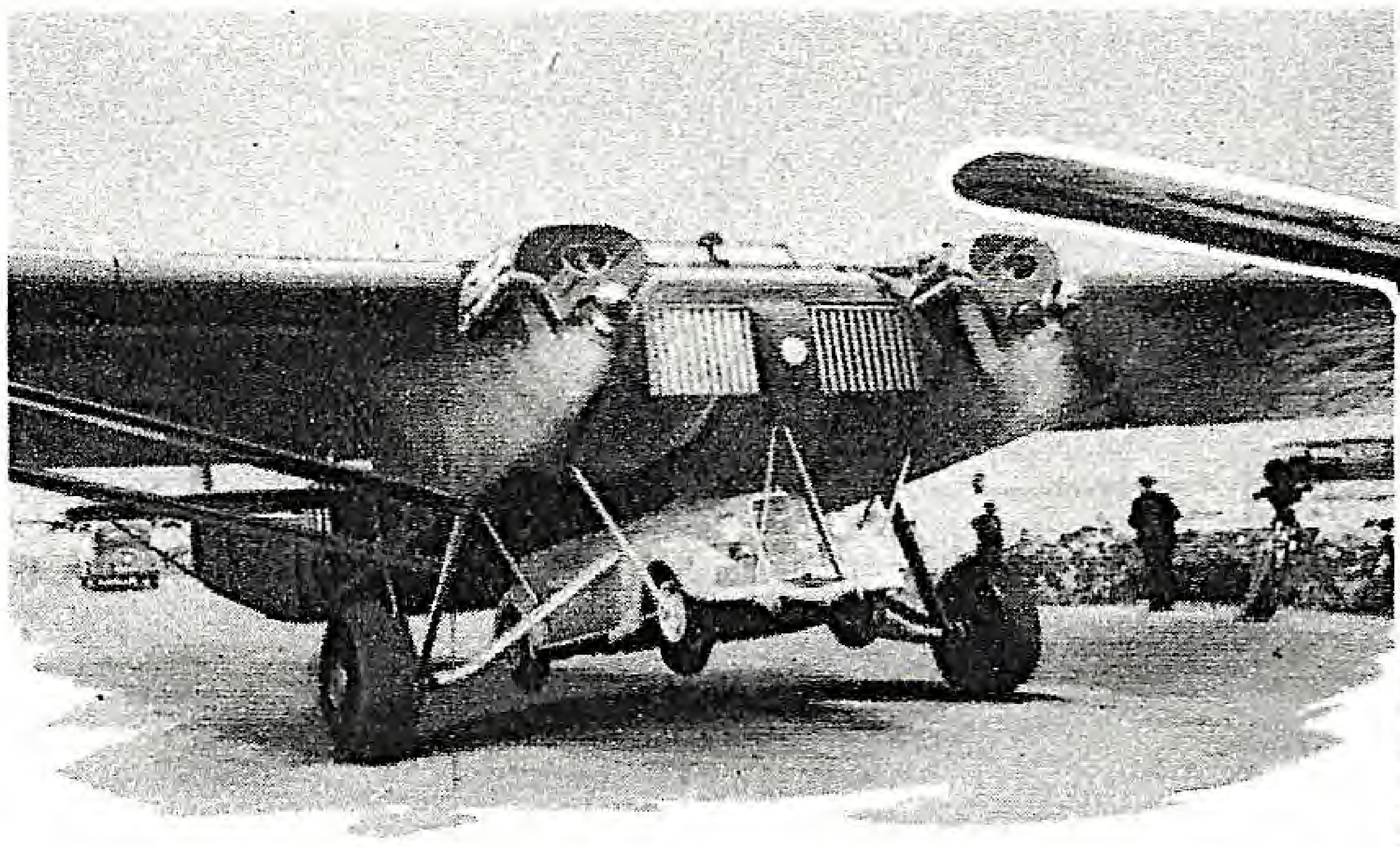
Recent advances in the application of electron tubes have made possible the development of a new type motor. A. H. Mittag and Dr. E. F. W. Alexanderson, consulting engineer, are shown standing before the motor's Thyratron equipment.

A REVOLUTIONARY new type of electric motor, which utilizes a "stationary commutator" and, while operating from an A. C. power source, possesses the characteristics of a series-type D. C. machine, has just been developed.

Known as a "Thyratron" motor, it has a number of noteworthy features, in addition to those mentioned above. The speed of the motor is independent of the frequency of the power supply. If the supply circuit is momentarily interrupted, the motor will, upon restoration of power, start immediately at its previous speed, without drawing excessive current from the line.

Motors of this type are applicable to such auxiliaries as fans, centrifugal pumps and compressors.

Auto Strapped To Plane Is Tested One Mile Above Earth

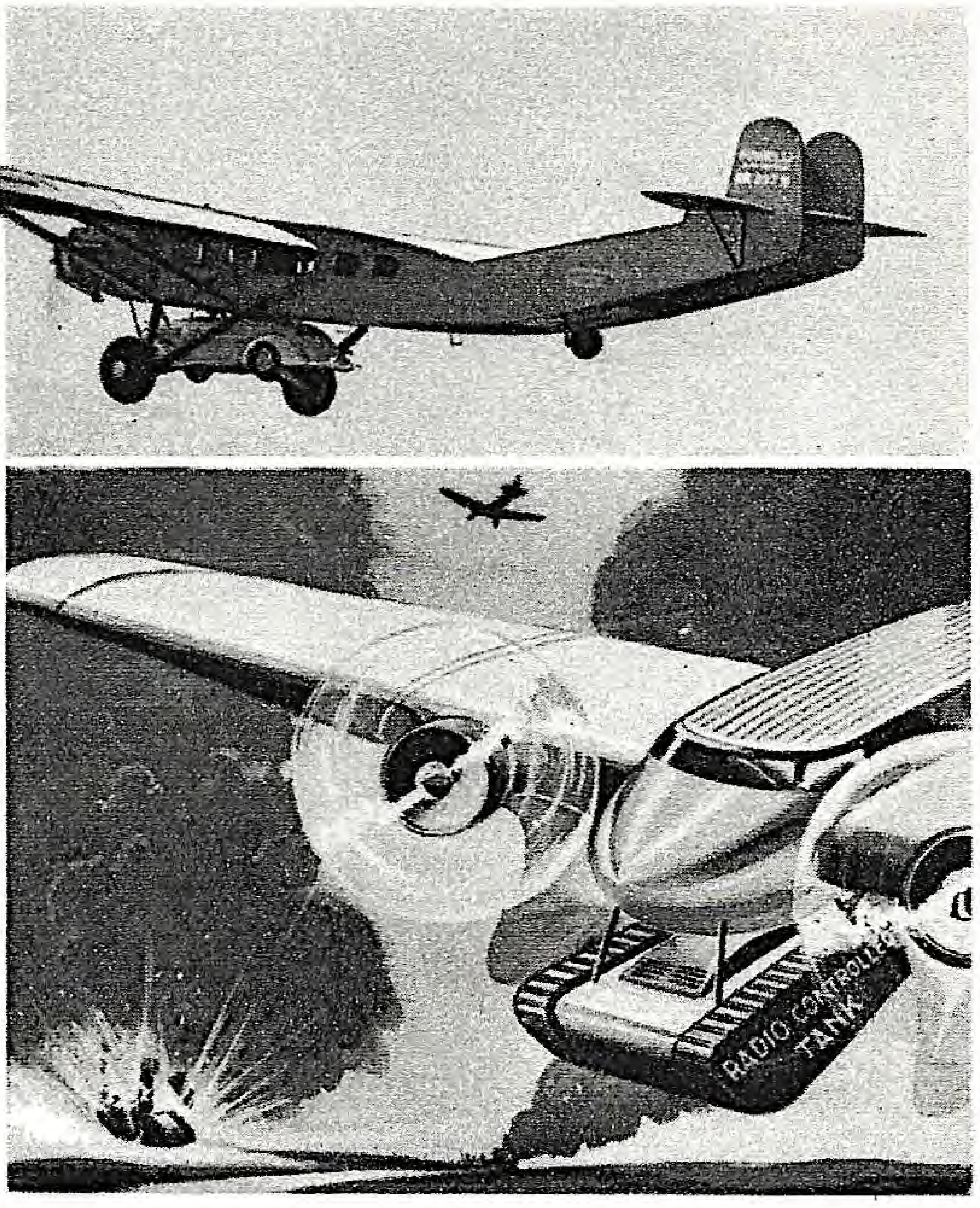


Strapped beneath landing gear of this giant Uppercu-Bernelli transport plane, this automobile recently was given a starting test by Zeke Meyer, racing driver, at altitude of more than a mile. Temperature was zero, speed 130 m.p.h.

A SPECTACULAR "first time in history"—an automobile actually taken for a mile high joy ride—recently astonished onlookers at Floyd Bennet Field, New York.

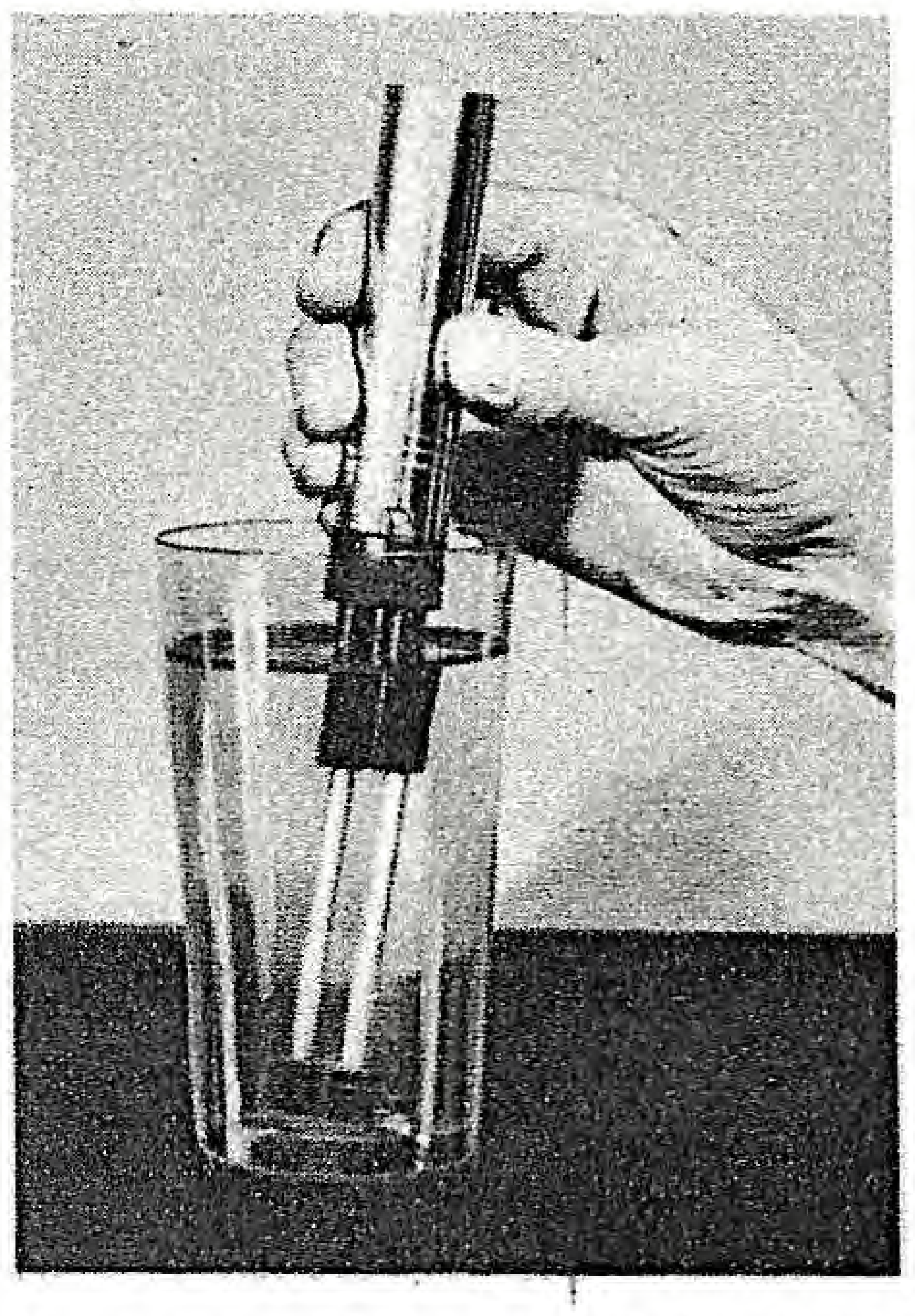
The plane was a giant Uppercu-Burnelli transport. With a 12-foot wide cabin, there was more than enough room between the wheels of the landing gear to strap on a standard 1935 automobile.

The thrilling adventure was an aviator's dream come true—a practical realization of the "Flying Tank" pictured on the July, 1932, cover of MODERN MECHANIX AND INVENTIONS. Heralding the introduction of new war time practices, transport planes could secretly land armored cars or radio controlled tanks behind enemy lines at night. Even light artillery or ambulance cars might be moved by air in this manner.



Upper right: Actual photo of flying wing transport having automobile snuggled under 12-ft. wide fuselage. Sketch shows how these planes would carry explosive-laden war tanks.

Water Is Sterilized In Ten Seconds



Batteries in handle of sterilizer send current between two silver electrodes immersed in the water.

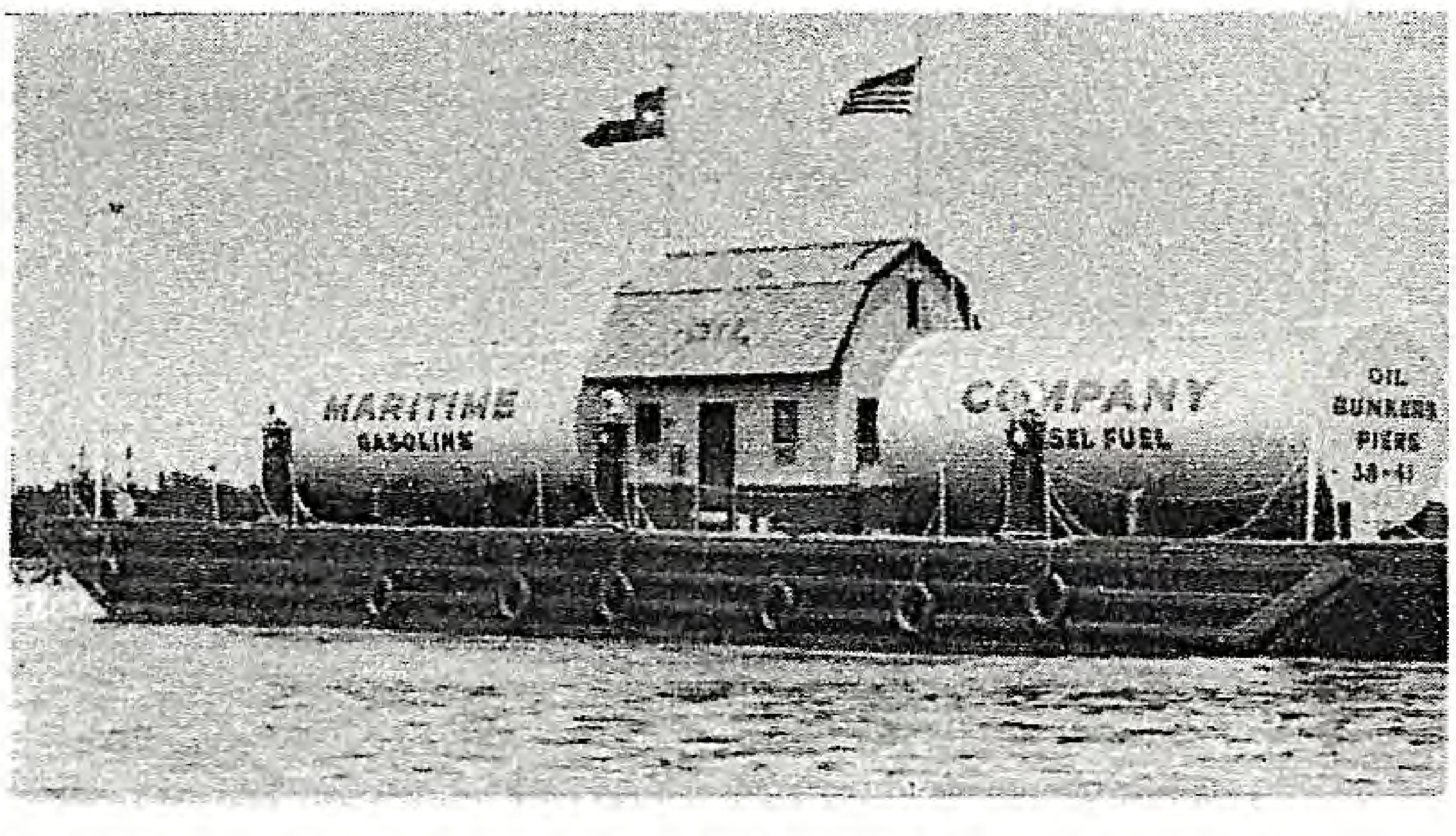
OUTDOOR enthusiasts can obtain pure, germ-free drinking water simply by immersing a compact electrical unit in a cup of water for about ten seconds. Two silver electrodes connected to flashlight cells deposit ionic silver which has high sterilizing qualities in drinking water.

Floating Gas Station Serves Boats

GALVESTON, TEXAS, has the first floating service station in Gulf waters. Though primarily intended to fuel small fishing craft, this floating barge has every facility for contacting larger vessels.

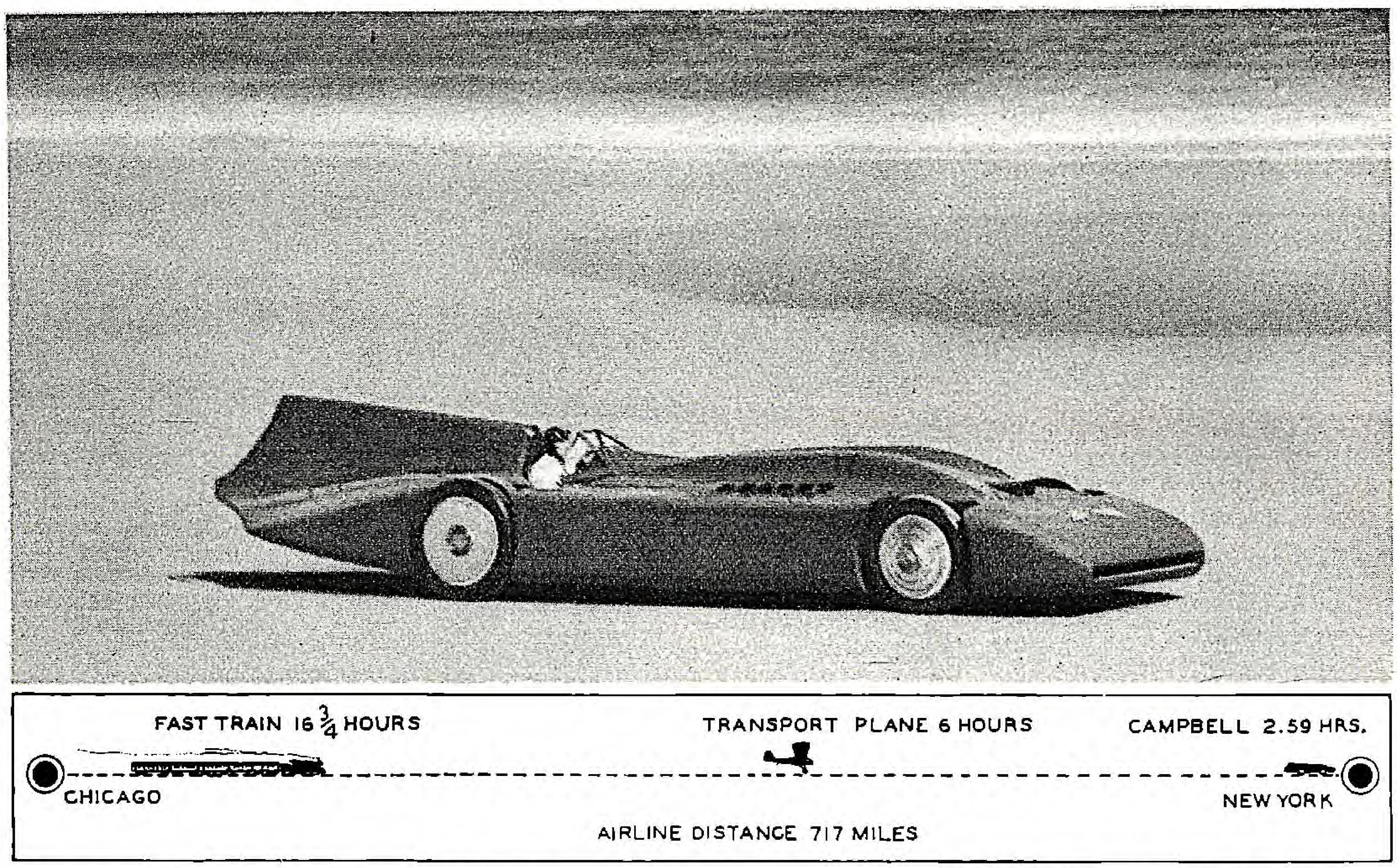
Gasoline, Diesel fuel, oil, kerosene, and fresh water are supplied 24 hours a day from six different pumps. The tanks on board have a combined capacity of around 50,000 gallons. Marine hardware and provisions are also supplied to boats which come up to this floating store.

Automobile tires hanging over the side act as bumpers when other boats approach.



Floating on sunny waters of Gulf of Mexico, near Galveston, this service station supplies fuel and oil to fishing vessels.

Campbell's Speed Cuts Chicago-New York Time to 2 Hours



Above—Campbell's 2,500 h. p. Bluebird thundering to new Speed record. Maintaining speed mark Bluebird could reach New York in 2.5 hours; regular transport plane would be half-way and fast train would be just one-sixth of distance.

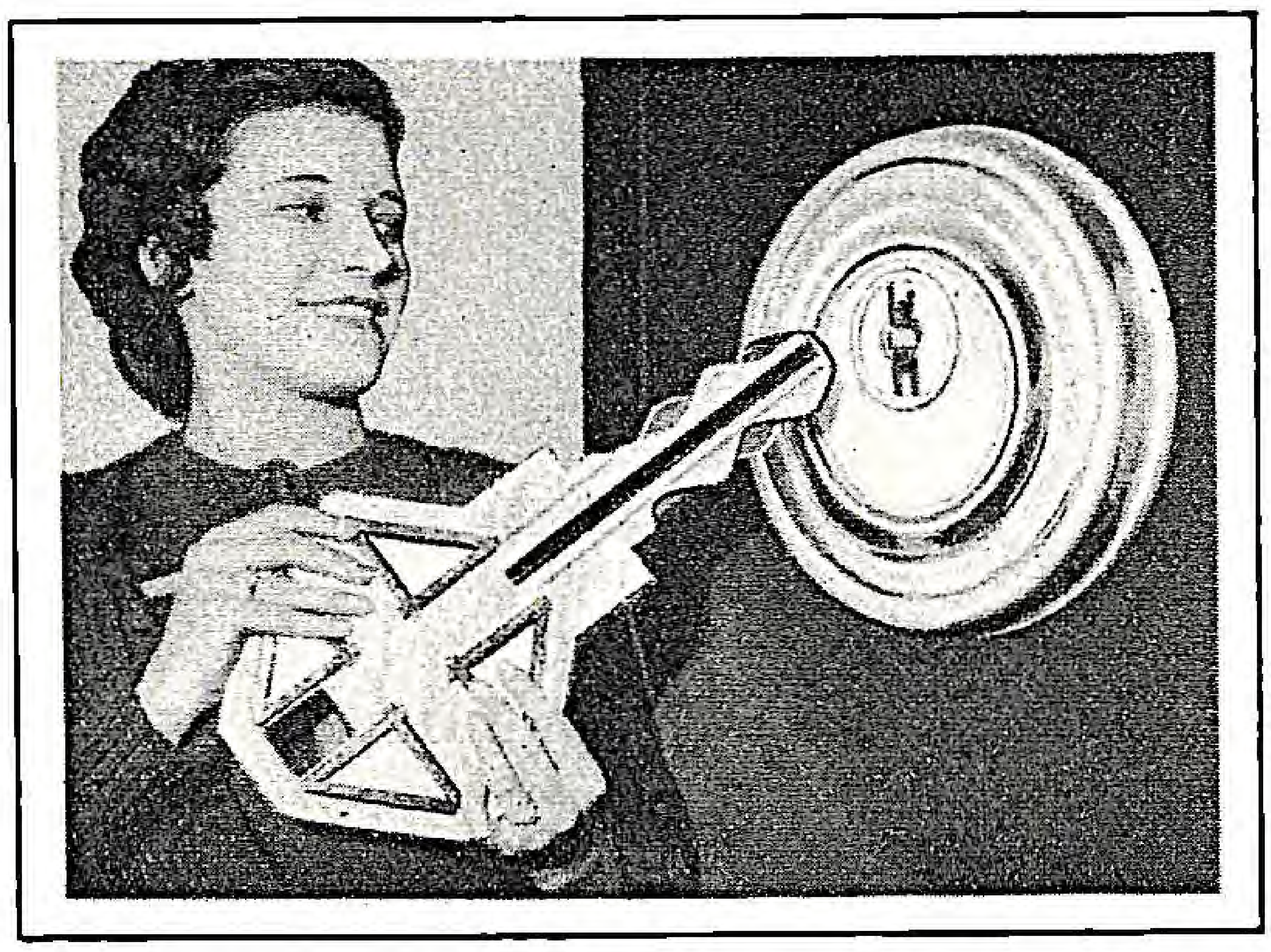
CHICAGO to New York would be just a jaunt at the new speed record attained by Sir Malcolm Campbell in his 2,500 horsepower Bluebird. Like a streak of lightning the Bluebird thundered over the sands at Daytona Beach, Fla., to a new world's automobile speed record of 276.816 miles an hour.

If it were possible to maintain that speed, the seven-ton Bluebird could cover the 717-mile airline distance from Chicago to New York in 2.5 hours. The terrific speed, however, probably would destroy in a few minutes any tire made today. In the short run of less than ten miles the Bluebird's tire casings were torn to ribbons, being worn down almost to the inner tubes. The lightning speed, too, made the slightest bump on the beach a hazardous obstacle, the Bluebird careening dangerously at one time when it struck an irregularity on the beach.

Amazing are the statistics of the new record. Campbell shifted from second to third at 150 m. p. h. In three miles the car had accelerated to 242.079 m. p. h. The fastest run over the measured mile was 281.03 m. p. h., covering the distance in 13 seconds, less than one-fourth of a minute, the fastest land speed attained by man.

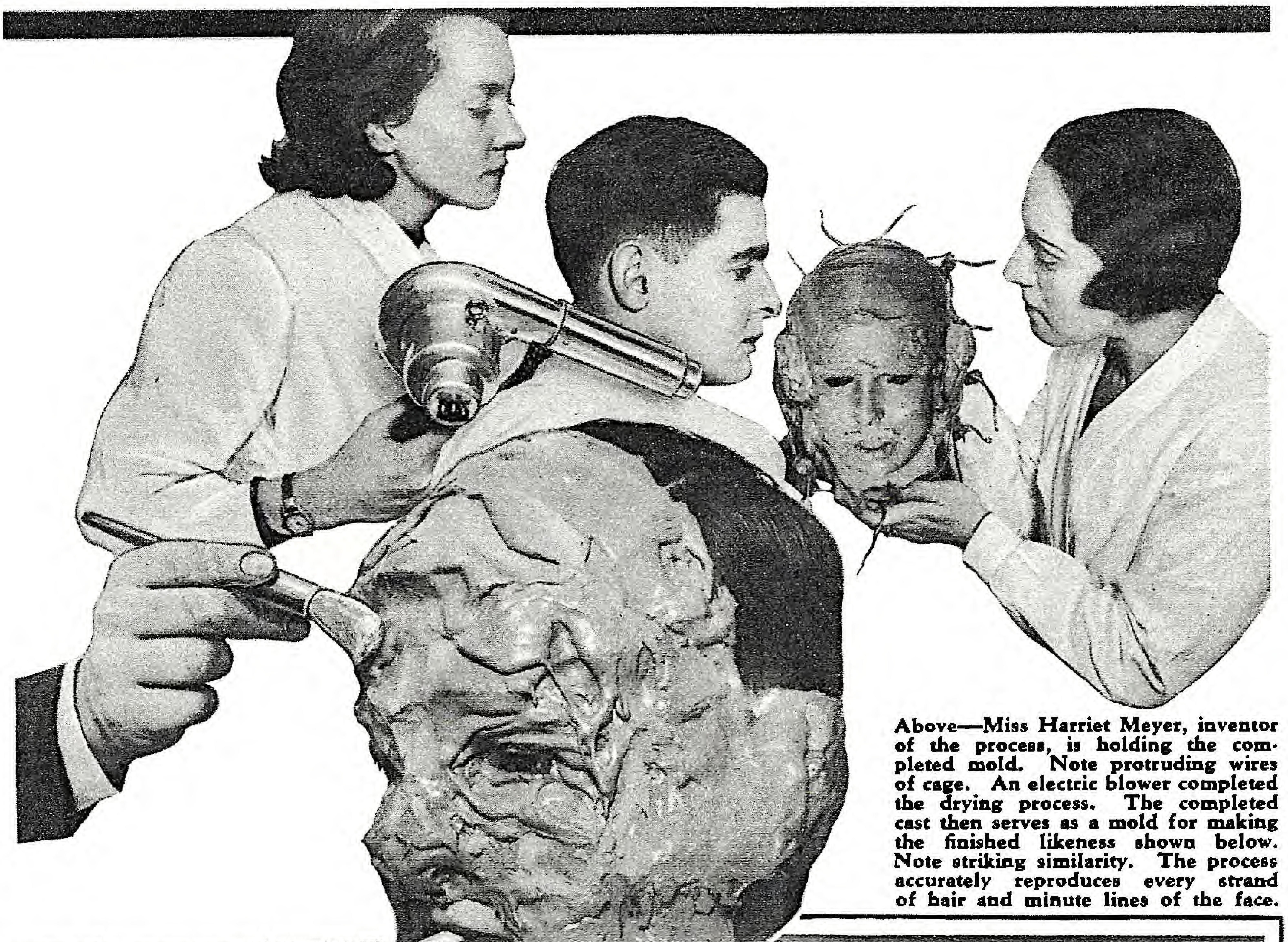
Novel Pick-Proof Lock Invented

A NEW pick-proof, drill-proof, jimmy-proof, grip-proof door lock, which can be opened only with a copy-proof key, is now on the market. Each lock is registered so that duplicate keys are obtainable only from the manufacturer. No key blanks will be sold. Every lock will be covered by a policy issued by Lloyd's which will pay the sum of one hundred dollars if the lock is picked.

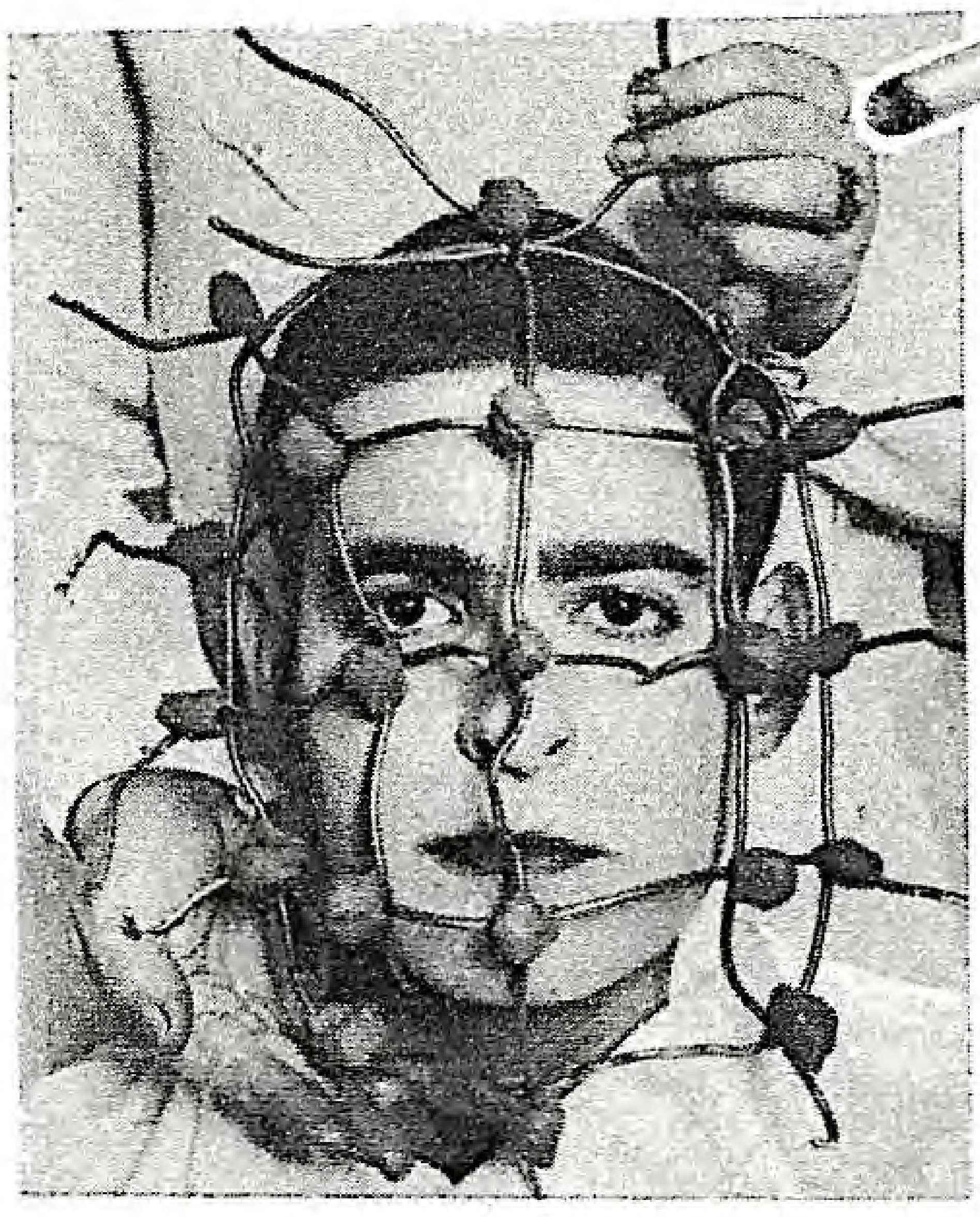


A large model of the new pick-proof lock, guaranteed against every form of burglary and fully insured, is shown above.

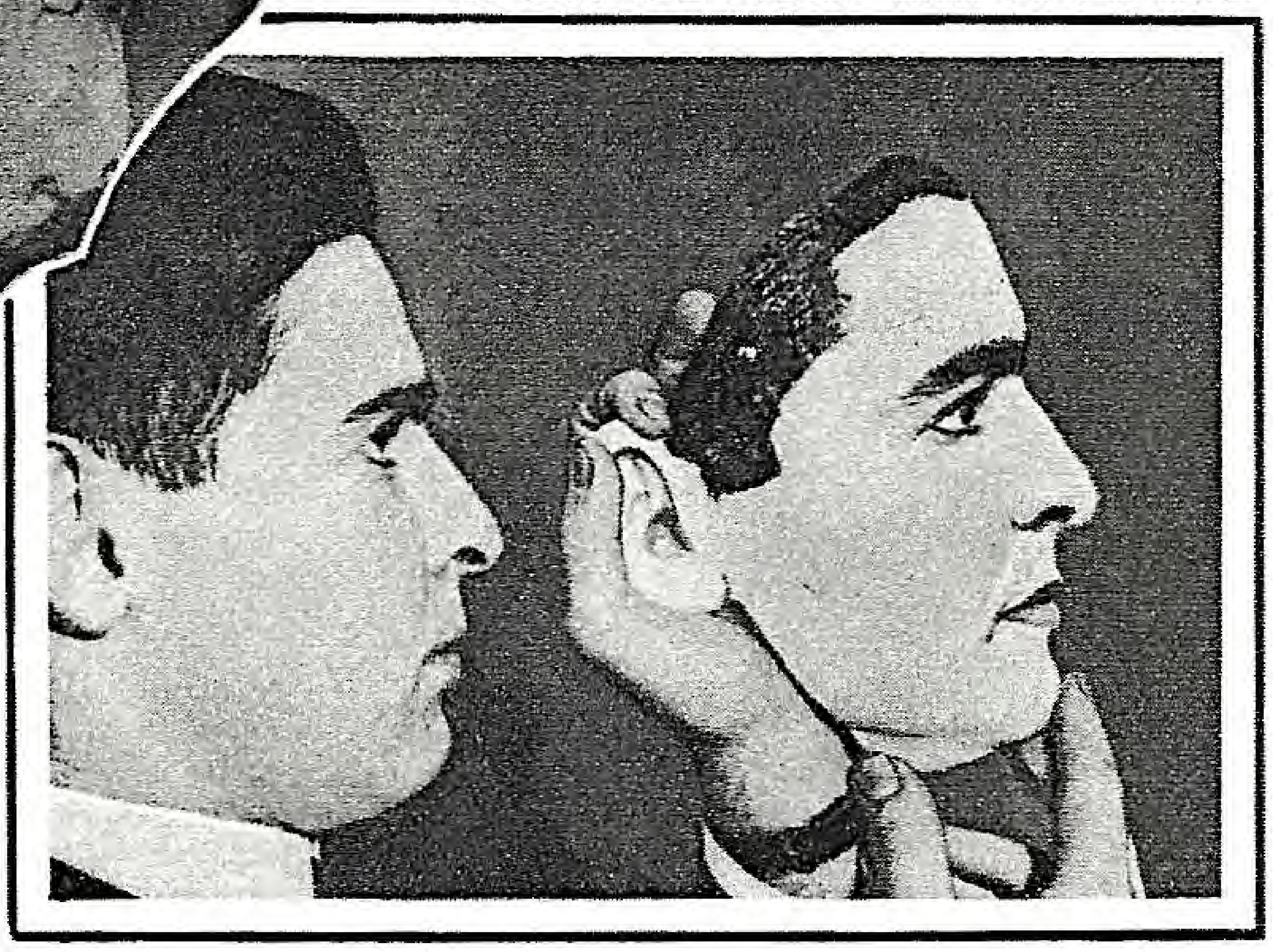
New Plastic Masks Replace Sculpturing



Above—Miss Harriet Meyer, inventor of the process, is holding the completed mold. Note protruding wires of cage. An electric blower completed the drying process. The completed cast then serves as a mold for making the finished likeness shown below. Note striking similarity. The process accurately reproduces every strand of hair and minute lines of the face.



Above—The warm, plastic substance is applied to the face by means of a brush. Several layers are applied until the desired thickness is built up. Note how it can be applied over hair. Left—After a layer of the plastic material is applied a malleable, brass cage is pressed into it and covered to prevent mold from breaking. Cage is first shaped to fit face.



As FAST as photography and almost as simple is a new process for making more accurate reproductions of head and bust than a sculptor can. Casts of heads can be made at low cost in 35 minutes.

A new type of plastic material, invented by Miss Harriet Meyer, is the secret of the process. This plastic substance, with which she covers the entire head of the subject, accurately reproduces every strand of hair and minute line. Yet the material does not stick to the subject. No oil is put on the face.

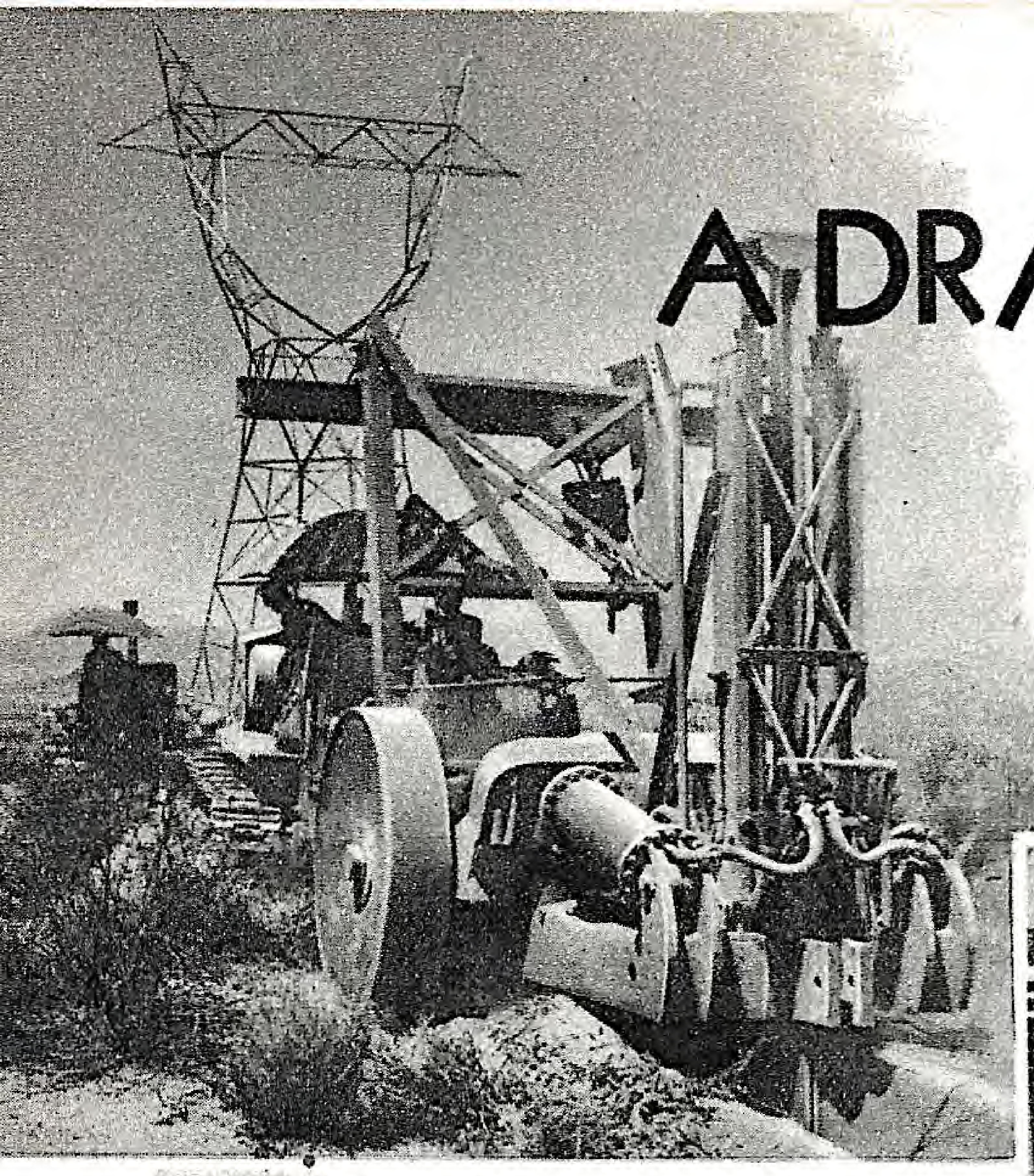
The subject can assume any expression he may wish to have reproduced. The plastic material is applied with a brush and a brass cage pressed in place. The mask is then dried with an electric blower. After drying, the mask, still flexible, is removed. It is then used to produce the finished head in plaster of Paris or bronze.

It is claimed the plastic material does not cause discomfort to the subject and no tubes are necessary to permit the subject to breathe easily.

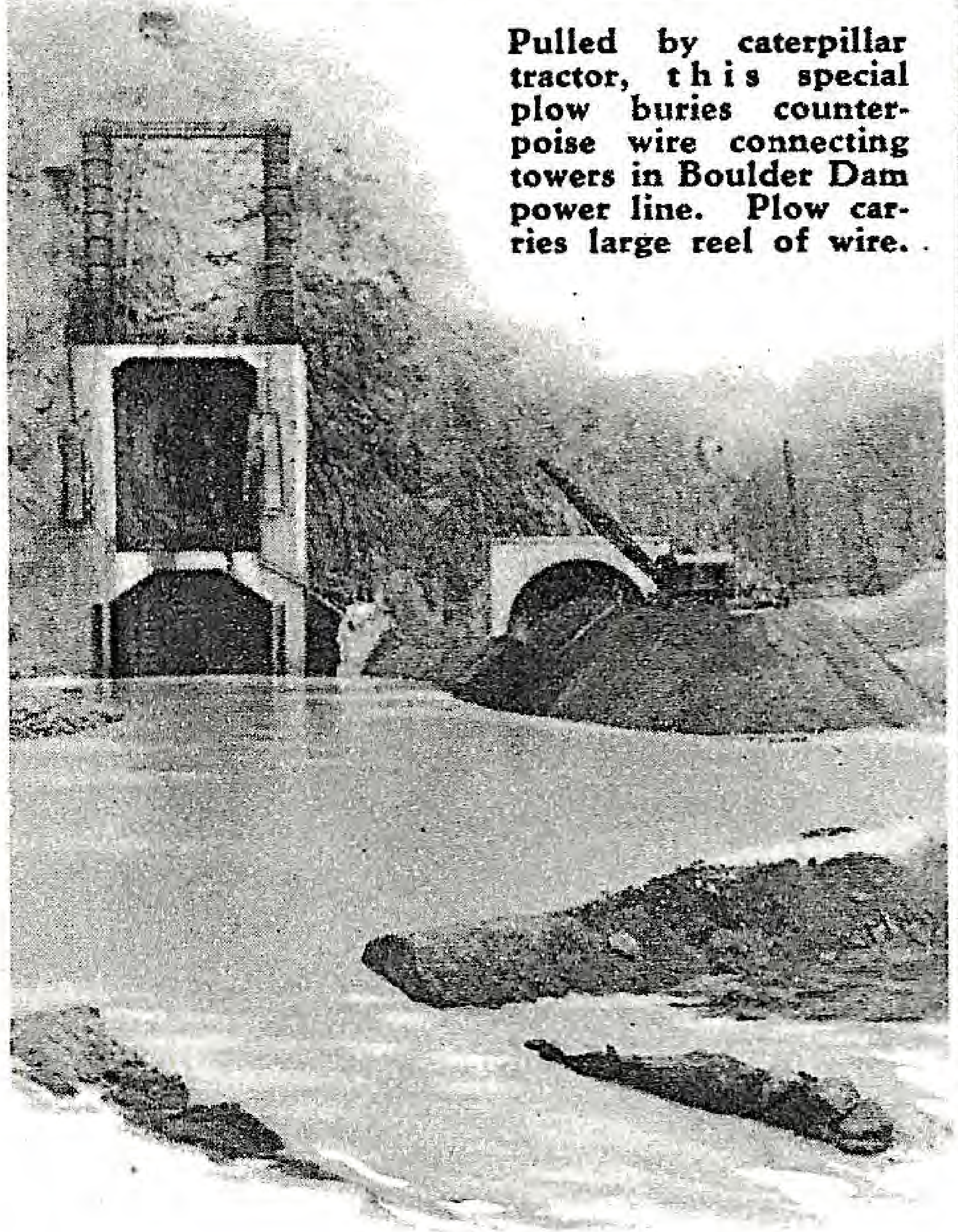
A DRAMA of POWER--

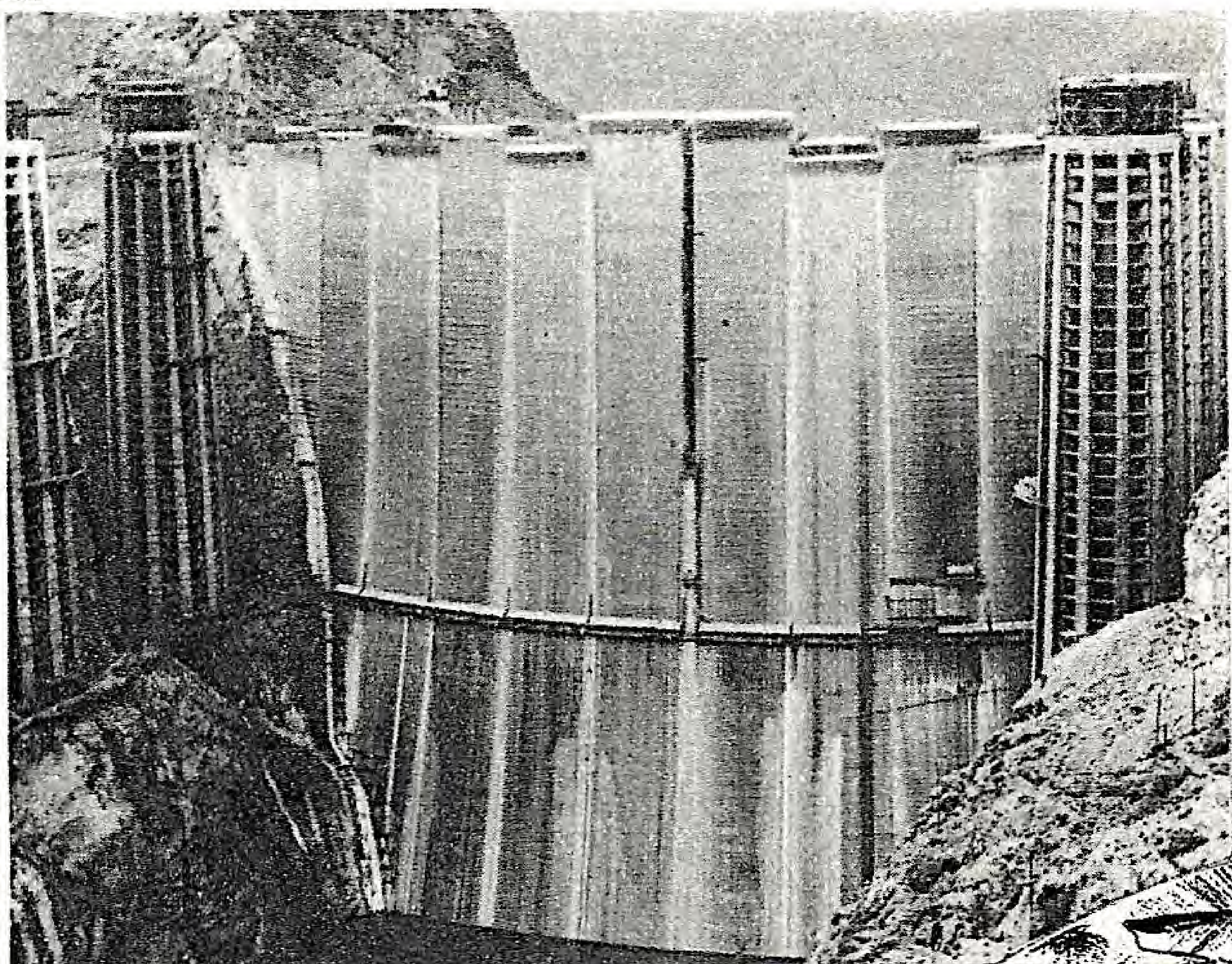
by J. L. BURKHOLDER

Assistant General Manager in Charge of Construction, Metropolitan Water District of Southern California.

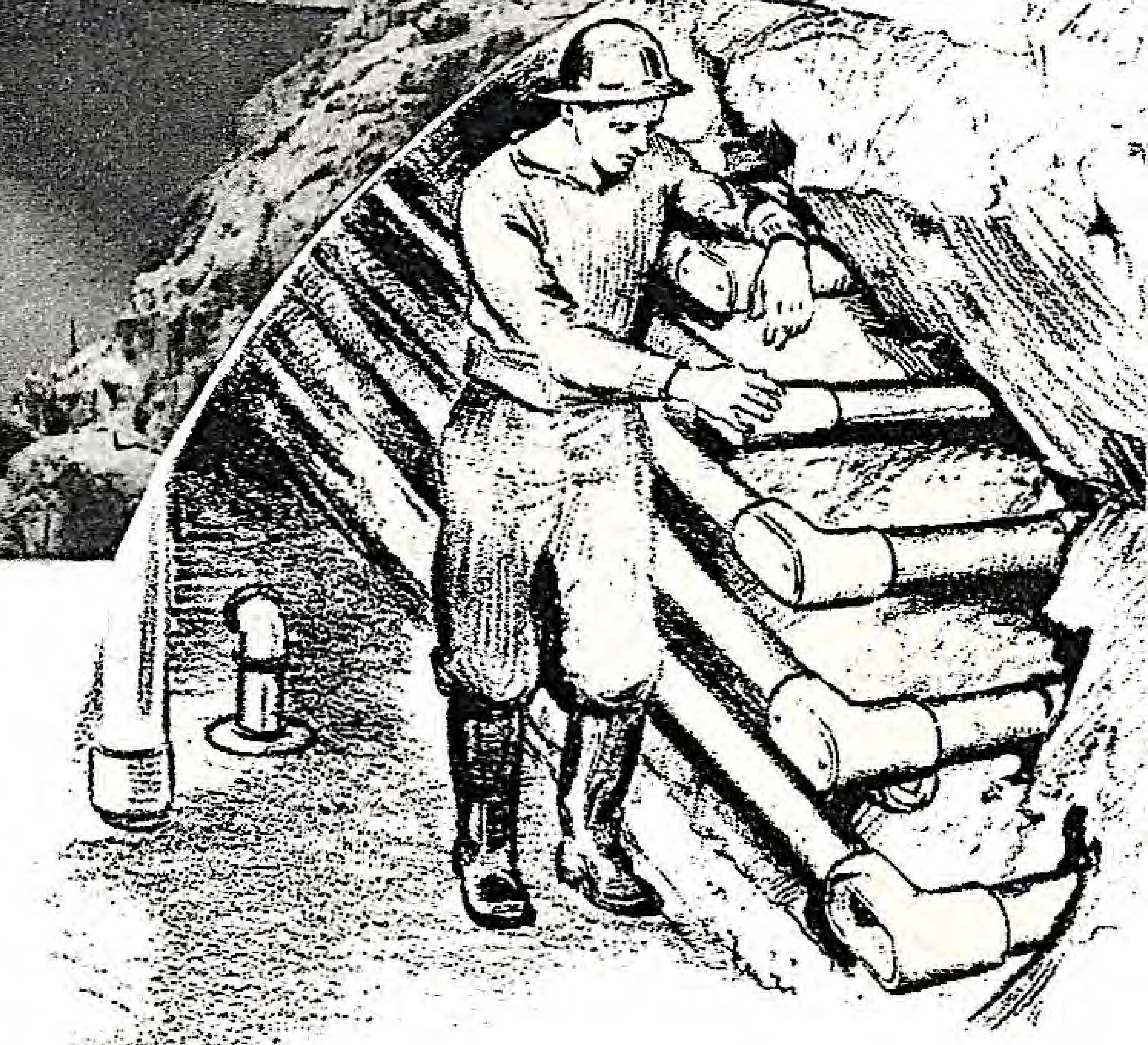


Pulled by caterpillar tractor, this special plow buries counterpoise wire connecting towers in Boulder Dam power line. Plow carries large reel of wire.





Lowering of this 3,000,000-pound steel door closed first of Colorado river diversion tunnels, marked beginning of huge reservoir which will extend 115 miles upstream, flooding area of 227 square miles. Photo at right shows water level rising behind massive Boulder Dam. Intake towers on either side will eventually be submerged, and then supply water for the power generating plant.



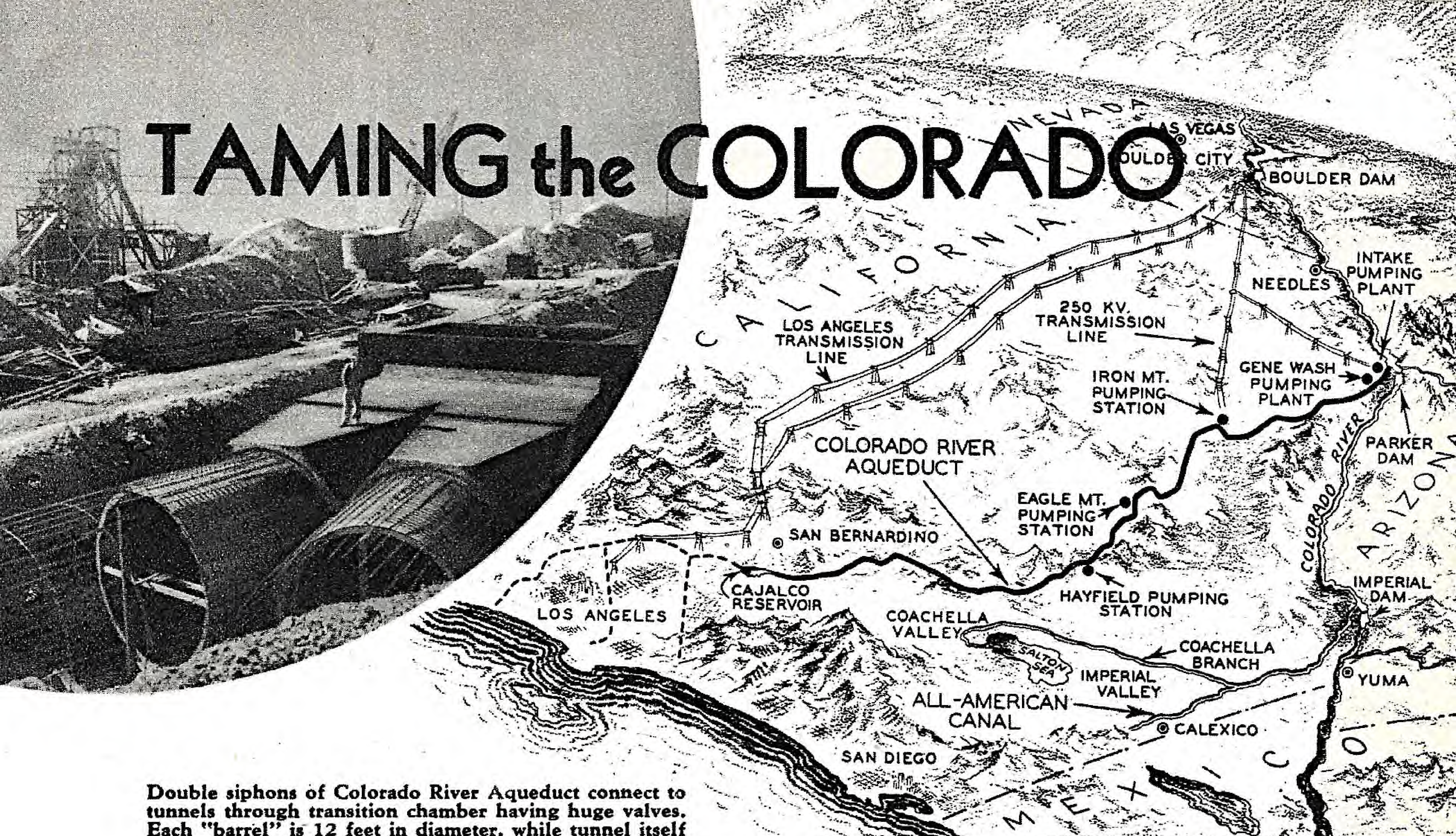
Wires in these pipes lead to 400 thermometers imbedded in concrete of Boulder Dam.

OVER the vast desert region of the Southwest, an empire of power and water is being built. Construction crews of four independent yet interrelated projects are bringing to completion structures which will guarantee to large urban and agricultural regions ample water and electricity for many years to come.

In a few months Boulder Dam, largest structure of its kind the world has ever seen, will be complete. Already the vast reservoir stretching far up the Colorado is filling; in a few months it will contain enough water to cover the state of Connecticut to a depth of 10 feet.

Sixty of the 92 miles of tunnels within the Colorado River Aqueduct system of the Metropolitan Water District have been excavated. When completed this huge aqueduct will be capable of carrying a billion gallons of Colorado River water daily 300 miles to 13 Southern California communities. In addition to

TAMING the COLORADO


NEVADA
LAS VEGAS
BOULDER CITY
BOULDER DAM
CALIFORNIA
INTAKE PUMPING PLANT
NEEDLES
LOS ANGELES TRANSMISSION LINE
250 KV. TRANSMISSION LINE
IRON MT. PUMPING STATION
GENE WASH PUMPING PLANT
COLORADO RIVER AQUEDUCT
PARKER DAM
EAGLE MT. PUMPING STATION
COLORADO RIVER
ARIZONA
SAN BERNARDINO
CAJALCO RESERVOIR
LOS ANGELES
HAYFIELD PUMPING STATION
IMPERIAL DAM
COACHELLA VALLEY
SALTON SEA
COACHELLA BRANCH
IMPERIAL VALLEY
YUMA
ALL-AMERICAN CANAL
CALEXICO
SAN DIEGO
MEXICO

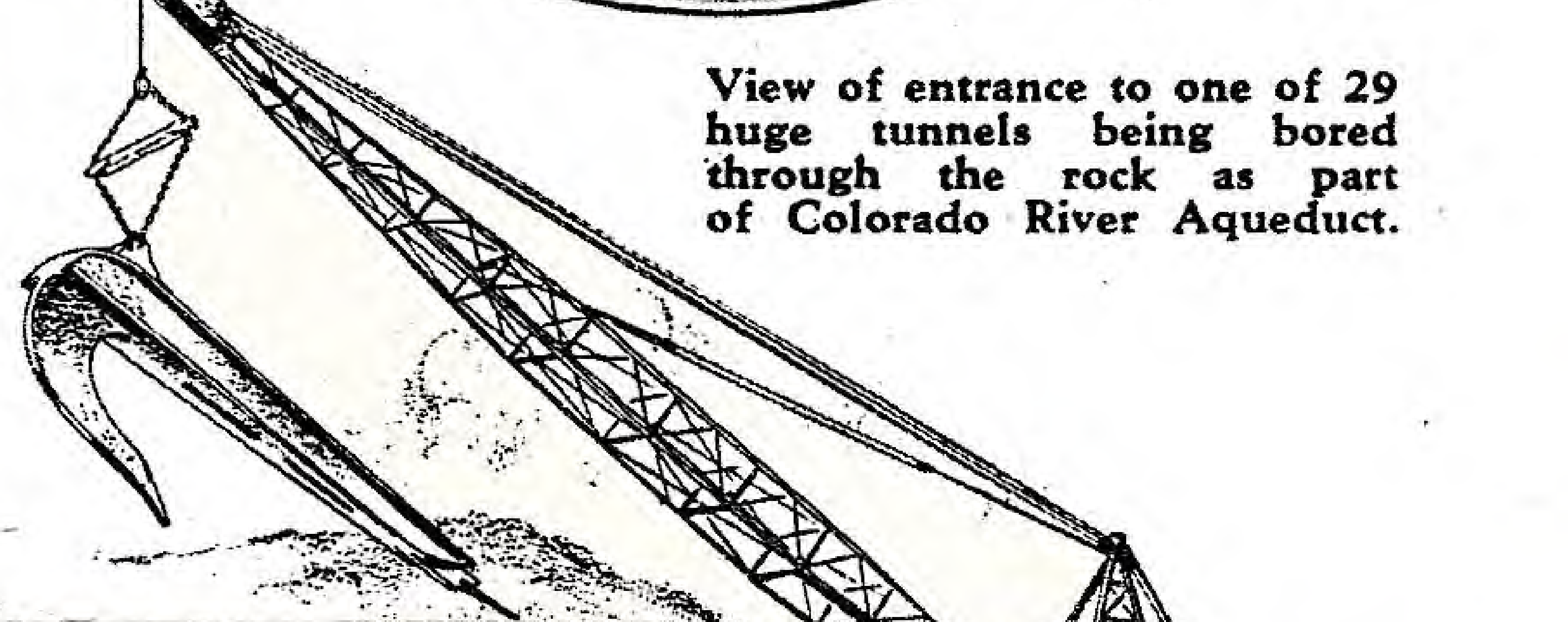
Double siphons of Colorado River Aqueduct connect to tunnels through transition chamber having huge valves. Each "barrel" is 12 feet in diameter, while tunnel itself is 16 feet in diameter. Map at right shows how all four projects are related to each other and to Boulder Dam.

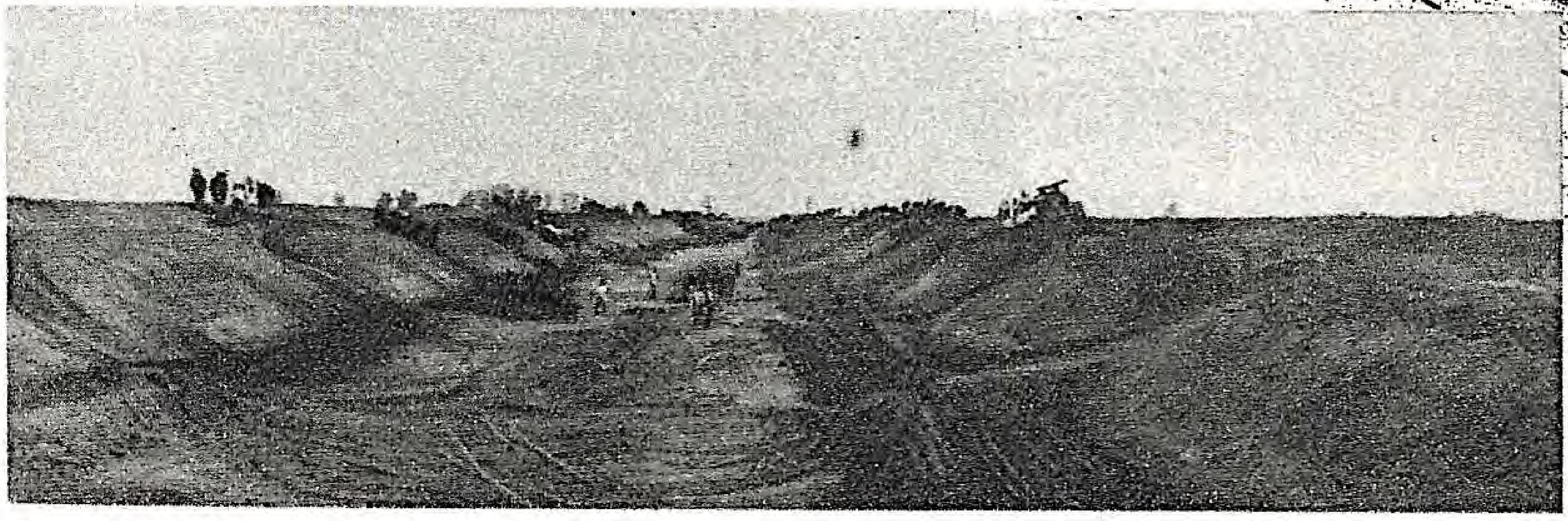
being the biggest of the four related Colorado River projects, Southern California's aqueduct will be the largest water carrier ever built by man.

From Boulder Dam, extending 270 miles across deserts and mountains, the largest long-distance transmission line is nearing completion. Early this autumn the last of its 2,680 towers—some of them 144 feet tall—will rise into the clouds, the large hollow conductors will be safely tied in place and the line ready to carry electric energy adequate to light nearly 5,000,000 homes simultaneously.

Along the southwestern border of the United States an 80-mile ditch—the All-American Canal—is being threaded across the desert between the Colorado river and the western edge of the great Imperial Valley. In addition to guaranteeing irrigation water to vast populated areas, this 200-foot canal will bring water to 200,000 acres now unirrigated and therefore unsuited for agriculture.

View of entrance to one of 29 huge tunnels being bored through the rock as part of Colorado River Aqueduct.

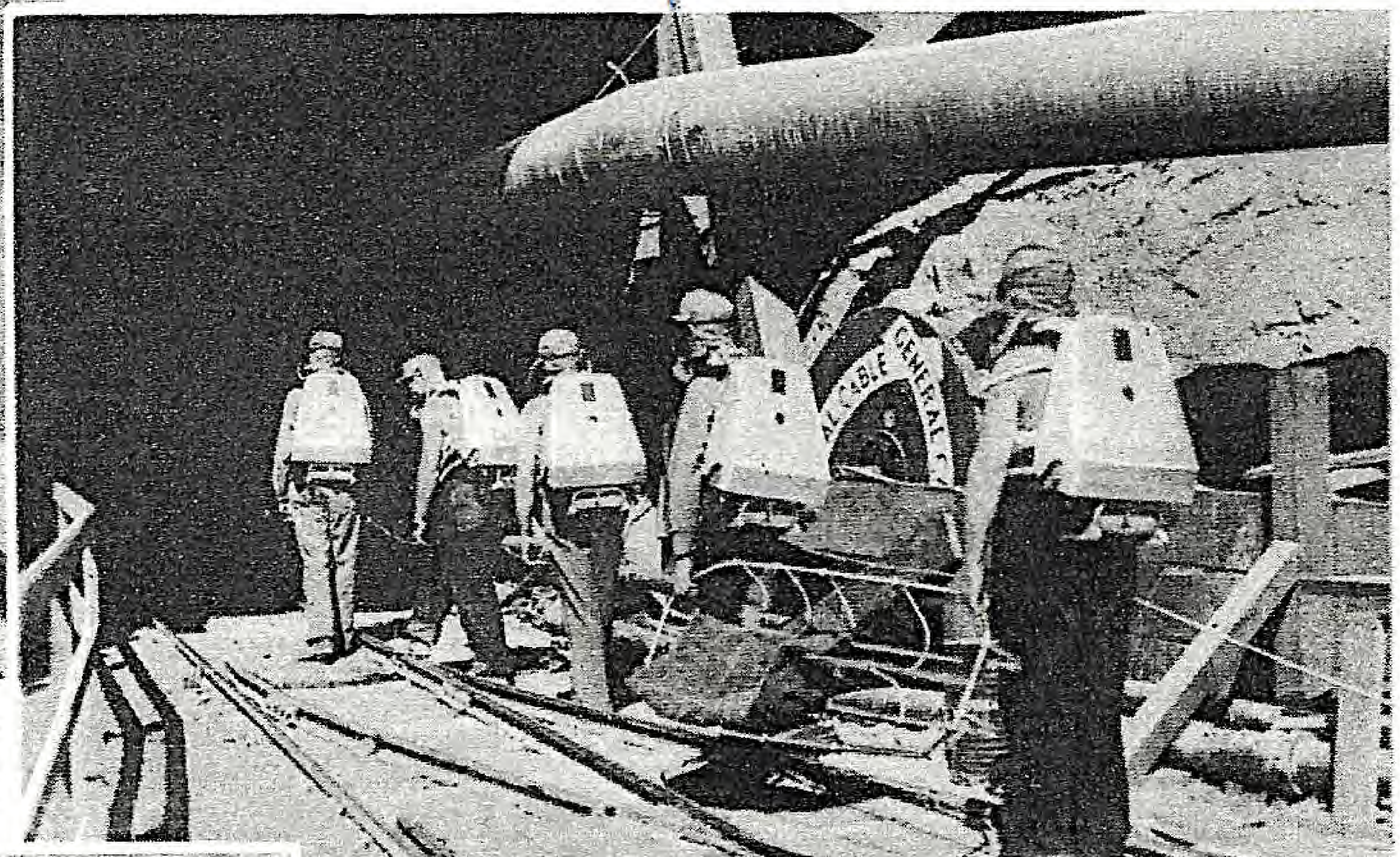




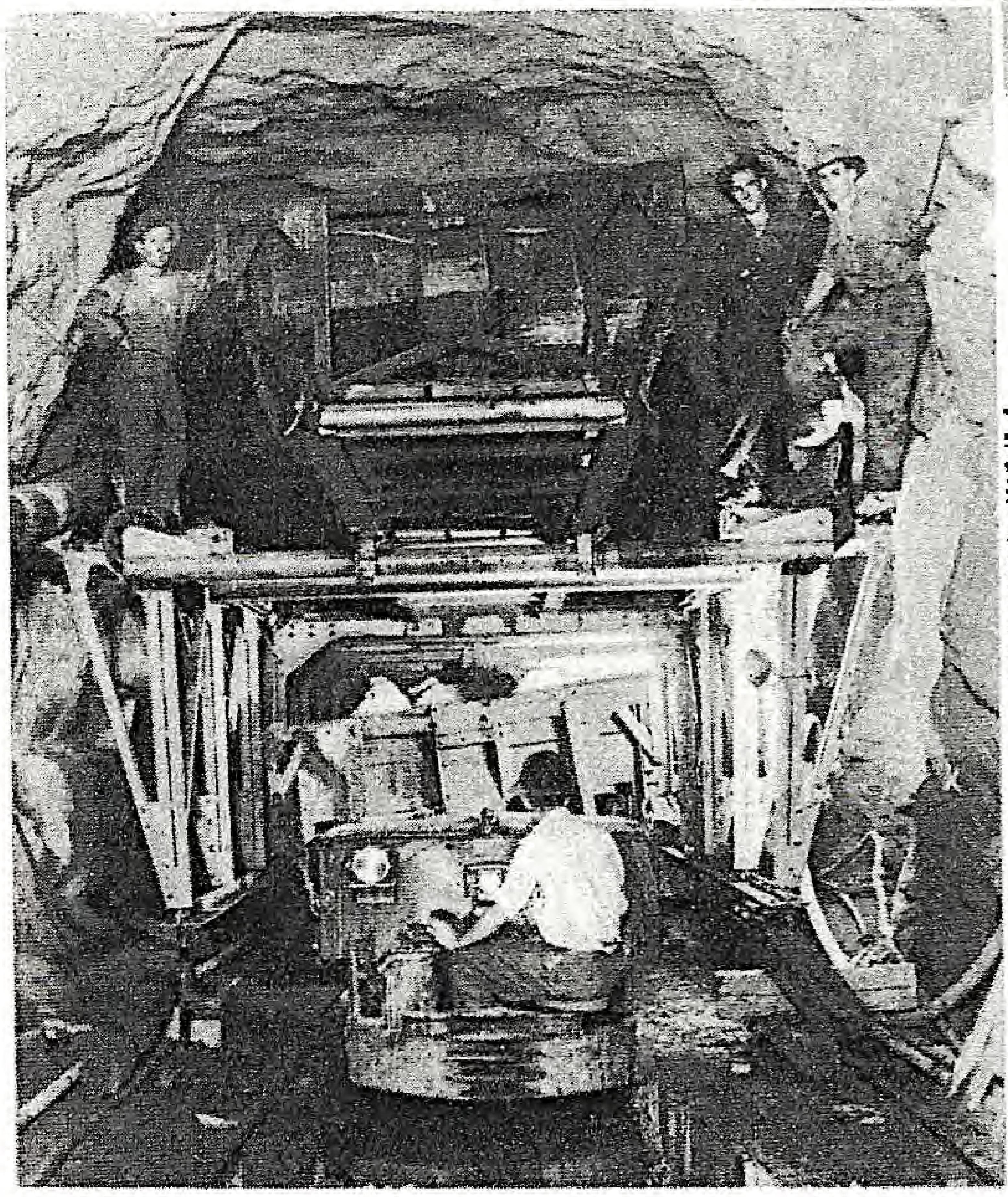
Digging the All-American Canal. When cement, gravel or loose stone is encountered, dragline operator goes fishing with this ten-ton hook to loosen material. Steel line used is two inches thick.

Aqueduct Has 92 Miles of Tunnels

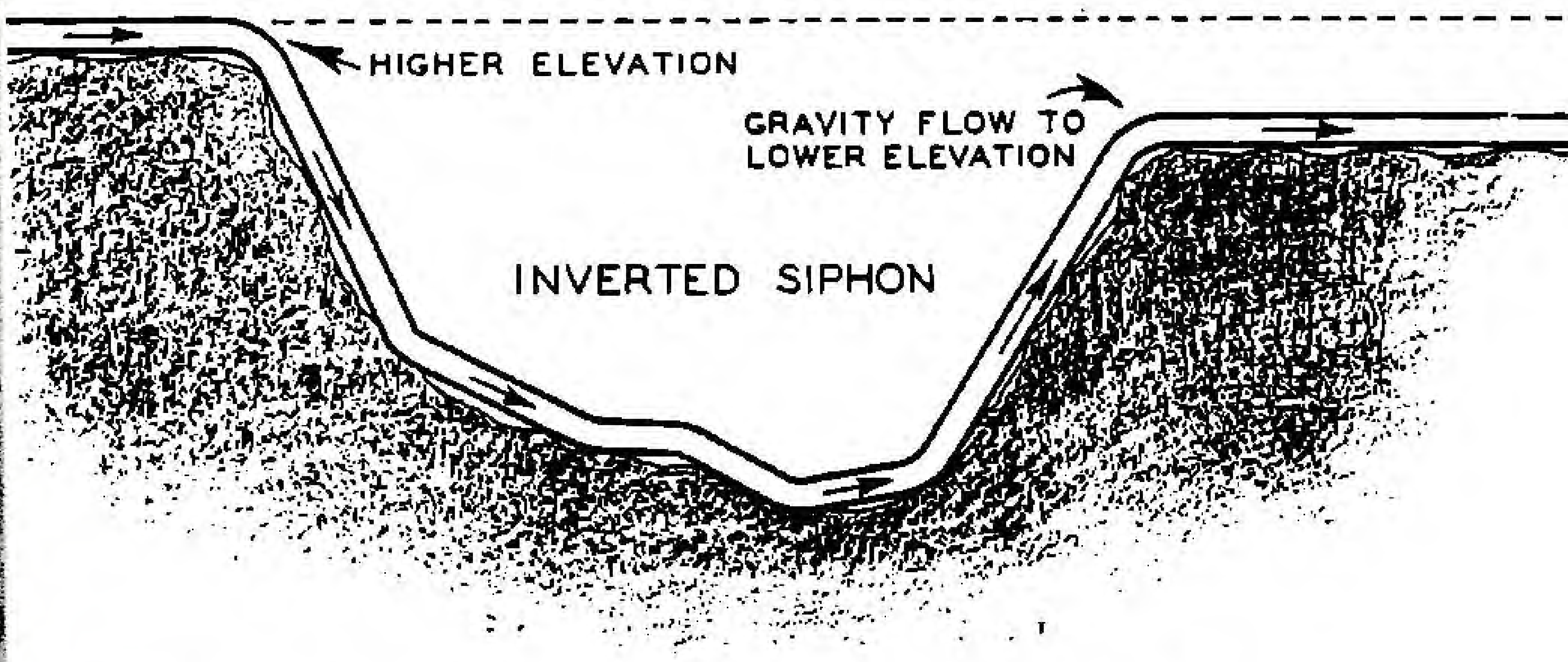
Workman is wetting down finished concrete lining of tunnel to prevent too-rapid drying. This tunnel section is completed.



Rescue squads stand ready to enter any tunnel in Colorado River Aqueduct system in case of disaster. Pipes carry air to prevent asphyxiation of men working far back in tunnel.



In "grasshopper" method of controlling traffic in tunnels, empty cars are swung overhead while loaded train moves out.



Inverted siphons like that above are not true siphons. Water finds its own level after plunging to bottom of canyon. Friction accounts for small loss in elevation. This construction is being used by Metropolitan Water District of Southern California in construction of Colorado River Aqueduct, to take place of flumes or arch supported structures crossing canyons.

Any one of these projects would have been considered a vast undertaking a few years ago, yet taken together they represent a coordinated plan of engineering and economics the like of which the world has never known.

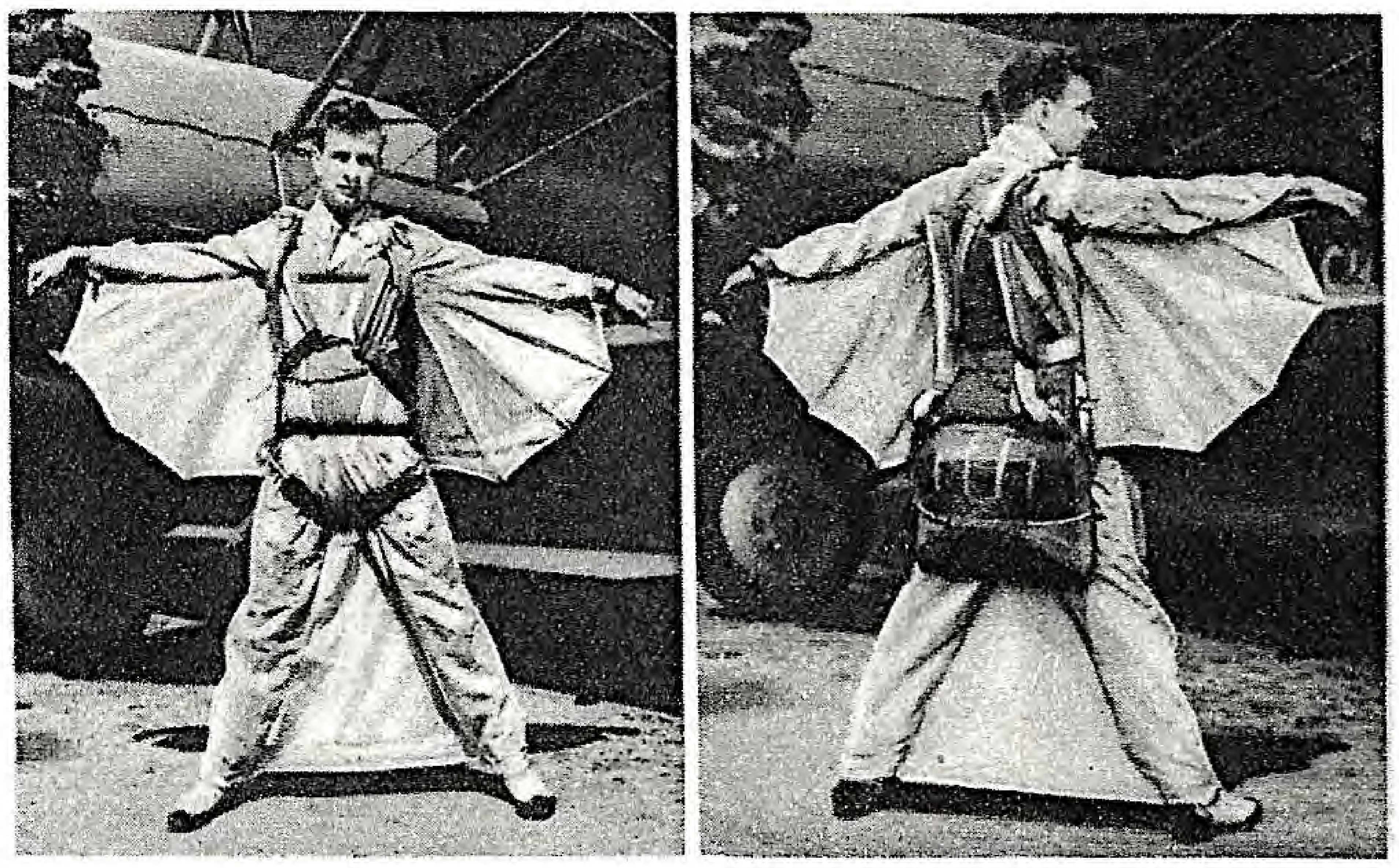
All are related to Boulder Dam, the fountain head of tremendous electrical energy. Together, they represent a cost of nearly $408,000,000. Of the several undertakings the Colorado River Aqueduct involves the largest expenditure—$220,000,000. Boulder Dam and the All-American Canal will cost $165,000,000 together, and the transmission line $22,800,000.

Parker Dam, to be built 155 miles down the Colorado from Boulder Dam, at a cost of some $9,000,000, is an important unit in the Colorado River Aqueduct project. This structure will be used primarily to divert and regulate the waters of the Colorado, rather than to store them. It will raise the water level approximately 80 feet, forming a reservoir 50 miles long, extending upstream from Parker, Arizona, to the city of Needles.

Immediately above Parker Dam, water for the aqueduct will be diverted from the river by huge pumps. Five gigantic electric pumping stations will lift the water a total of 1,618 feet until it reaches the summit 100 miles

[*Continued on page* 135]

Daring Bird-Man Soars At 10,000 Ft. On Homemade Wings



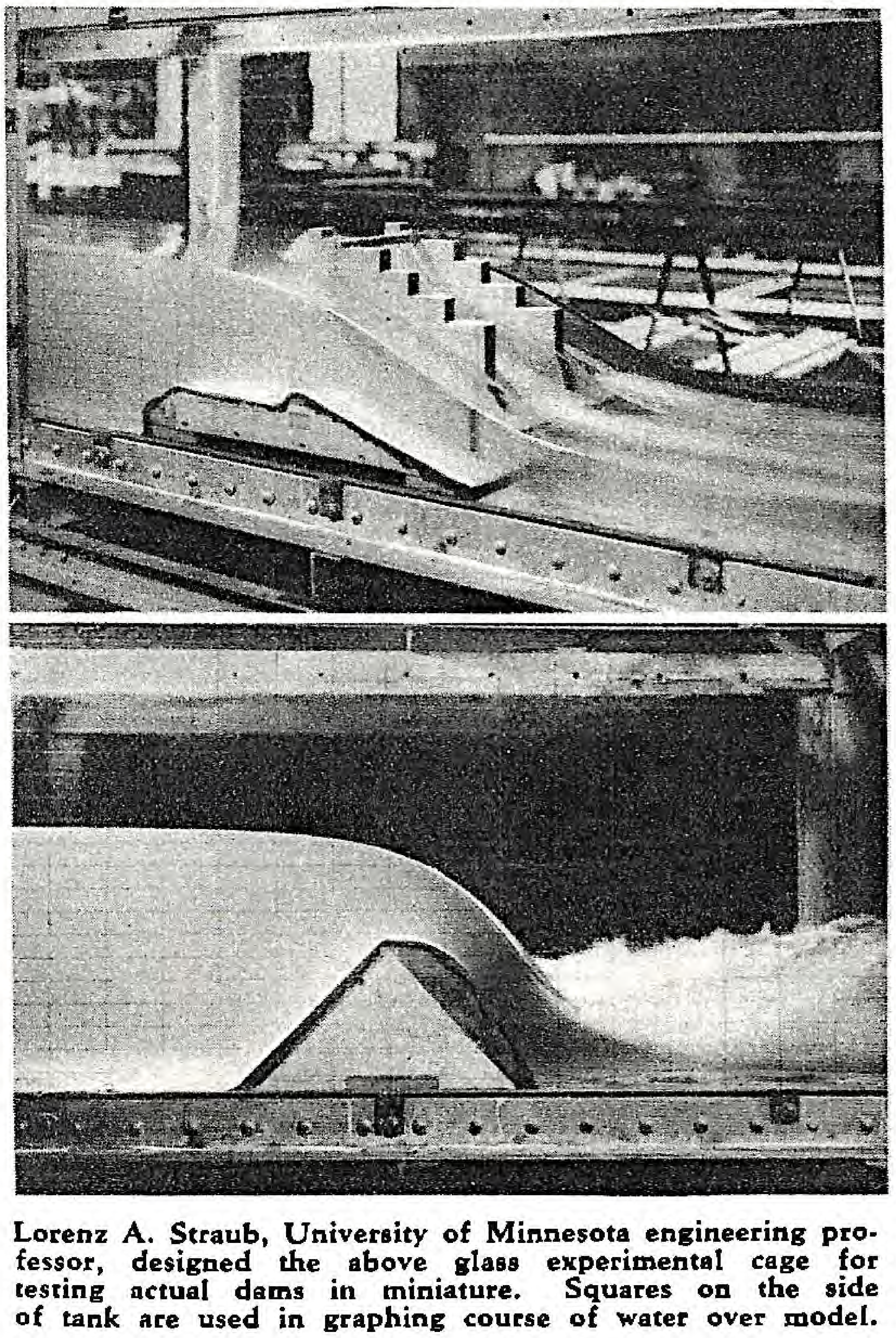
Like a modern Icarus, Clem Sohn, parachute jumper, has won the distinction of being the first to glide through the air under his own power. Sohn is seen above with his apparatus which works only when arms and legs are spread.

FOR three years Clem Sohn, parachute jumper of Lansing, Michigan, dreamed of the time when man might go aloft and soar like a bird. Recently his dream became a reality.

Clad with foot-webbing and home-made wings of airplane canvas, he bailed out of a ship at an altitude of 12,000 feet. During the first 2,000 feet of his fall, he kept his wings folded at his side while he tested his leg-webbing. Slowly, he opened his wings to check his descent, and for more than a minute he banked, looped, climbed and zoomed to right and left. At 6,000 feet he pulled the rip cord of his parachute and floated back to earth.

While aviation authorities who witnessed the stunt failed to see any practical value in man's new "conquest of the air," Sohn was already at work designing bigger wings and planning future aerial maneuvers.

Dam Models Reveal Costly Errors

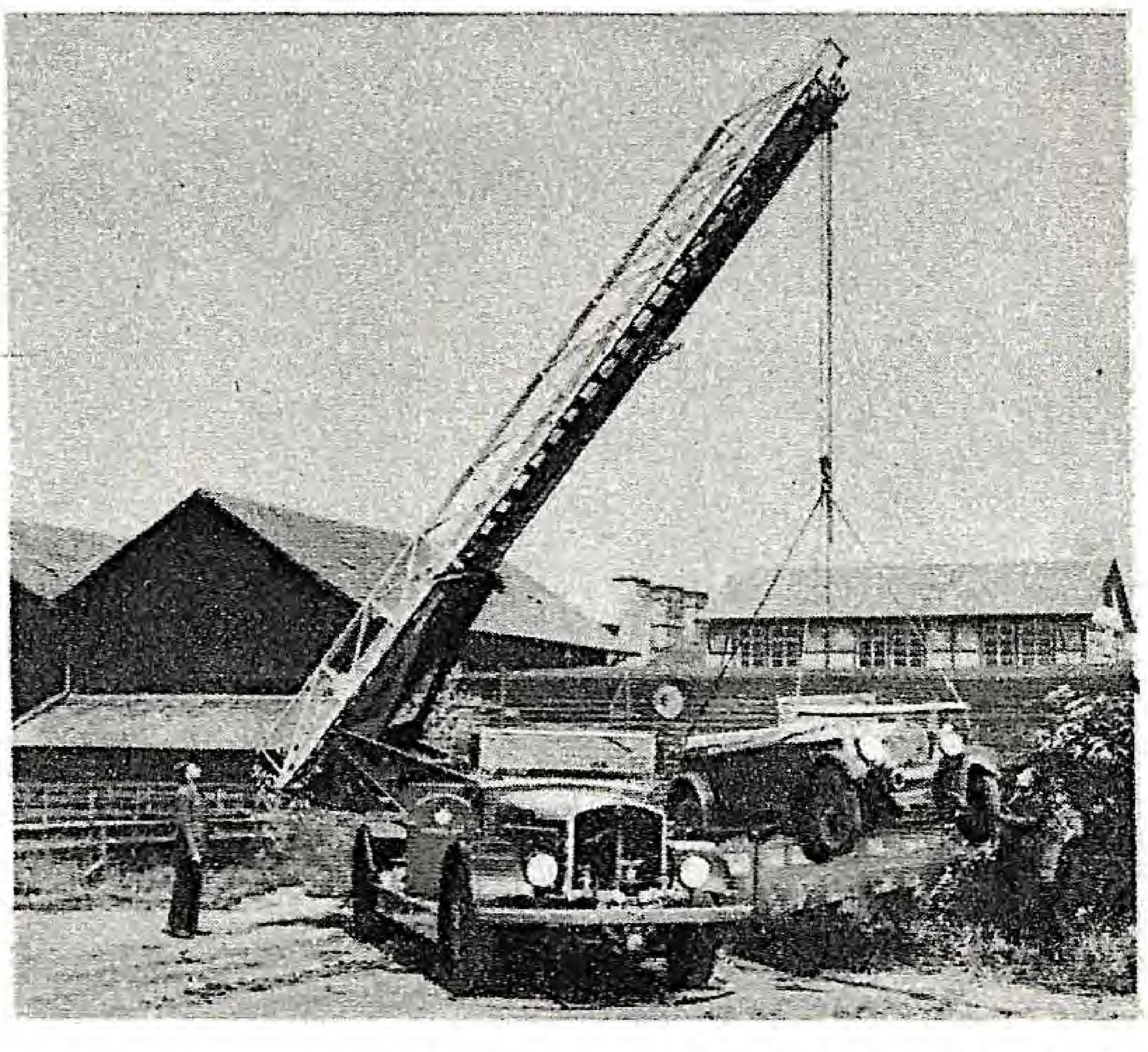


Lorenz A. Straub, University of Minnesota engineering professor, designed the above glass experimental cage for testing actual dams in miniature. Squares on the side of tank are used in graphing course of water over model.

MINIATURE dams, subjected to floods, tides, waves and wind which are created artificially in huge experimental glass cages, now reveal in a few hours structural flaws which ordinarily would take years to uncover.

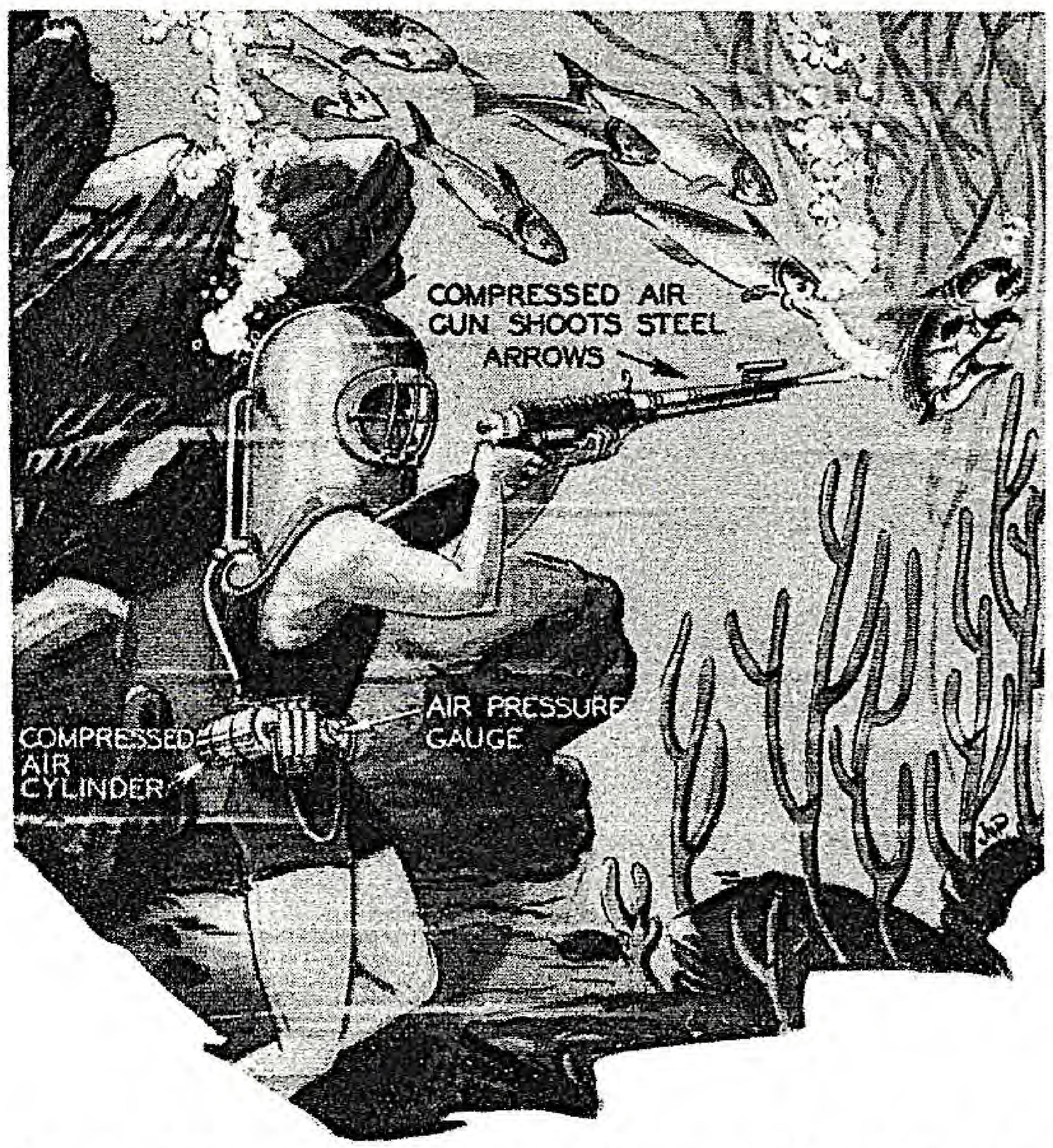
Fire Ladder Hoists Ditched Car

FIRE ladders can be used for a variety of purposes, but one of the most practical emergency applications of the ladder in rescue work has originated in Germany. When all attempts to retrieve a motorcar which had skidded accidentally into a small ditch had failed, the Berlin fire-brigade was called to the scene. Heavy ropes and a crane-hook were fastened to the end of the ladder and the ditched vehicle.



Fire ladder, used as a crane, rescues automobile after wreck.

Diver Hunts Fish Under Sea With New Compressed Air Gun



New powderless gun shoots thin steel arrows with machine gun rapidity, making under-sea fish-hunting expeditions possible.

UNDER-SEA hunting expeditions are now possible, with the development of a diving helmet weighing only 12 pounds, and a new gun shooting arrows of steel.

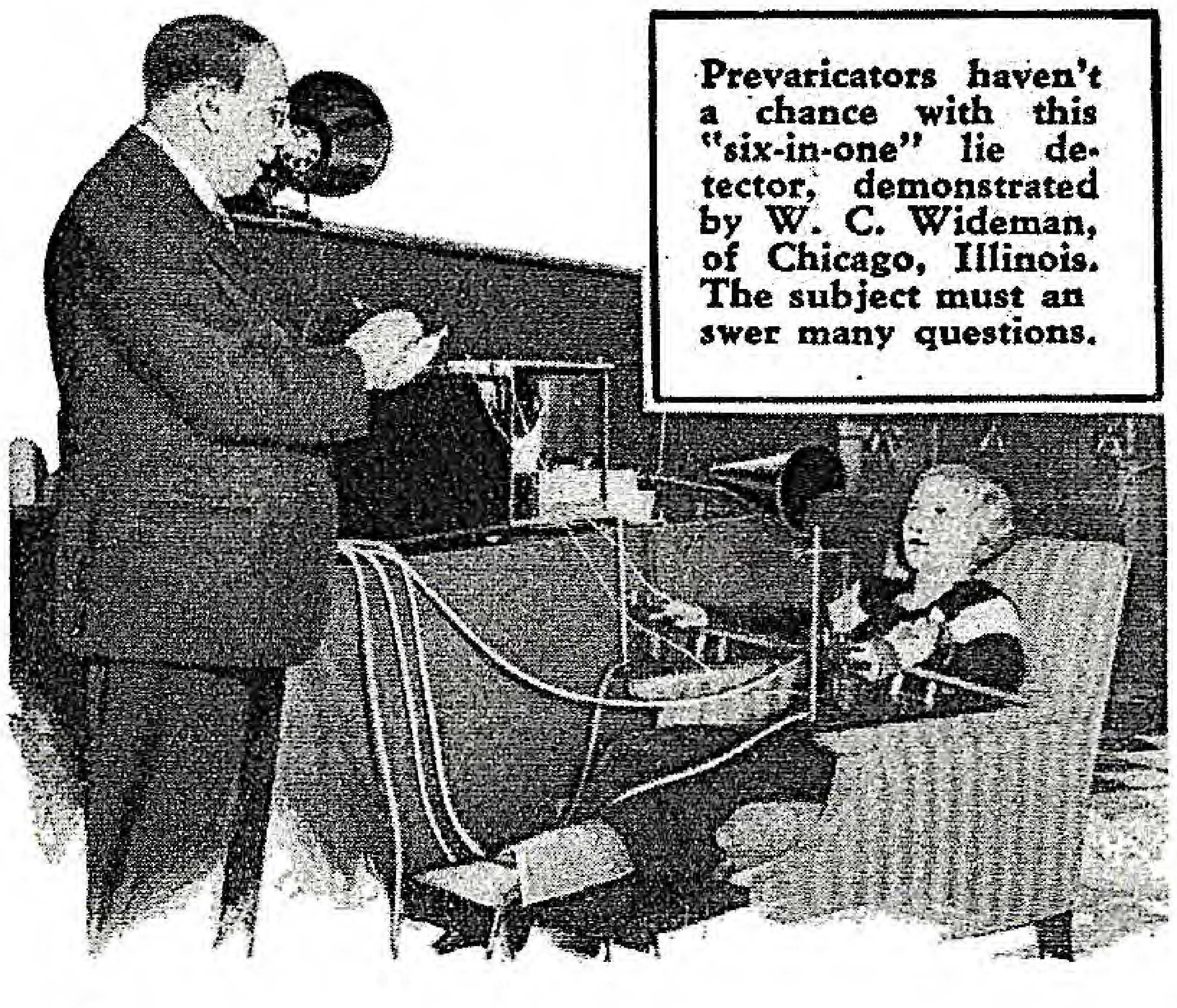
The diver carries along his own air supply, in a single compressed air cylinder which supplies both the helmet and the gun. One tank will allow an under-water trip of approximately 25 minutes.

The equipment can be used only in fairly shallow locations, since no provision is made for water pressure. The diver can move about freely, unhampered by the heavy air lines or safety chains formerly used.

Lie Detector Makes Six Tests

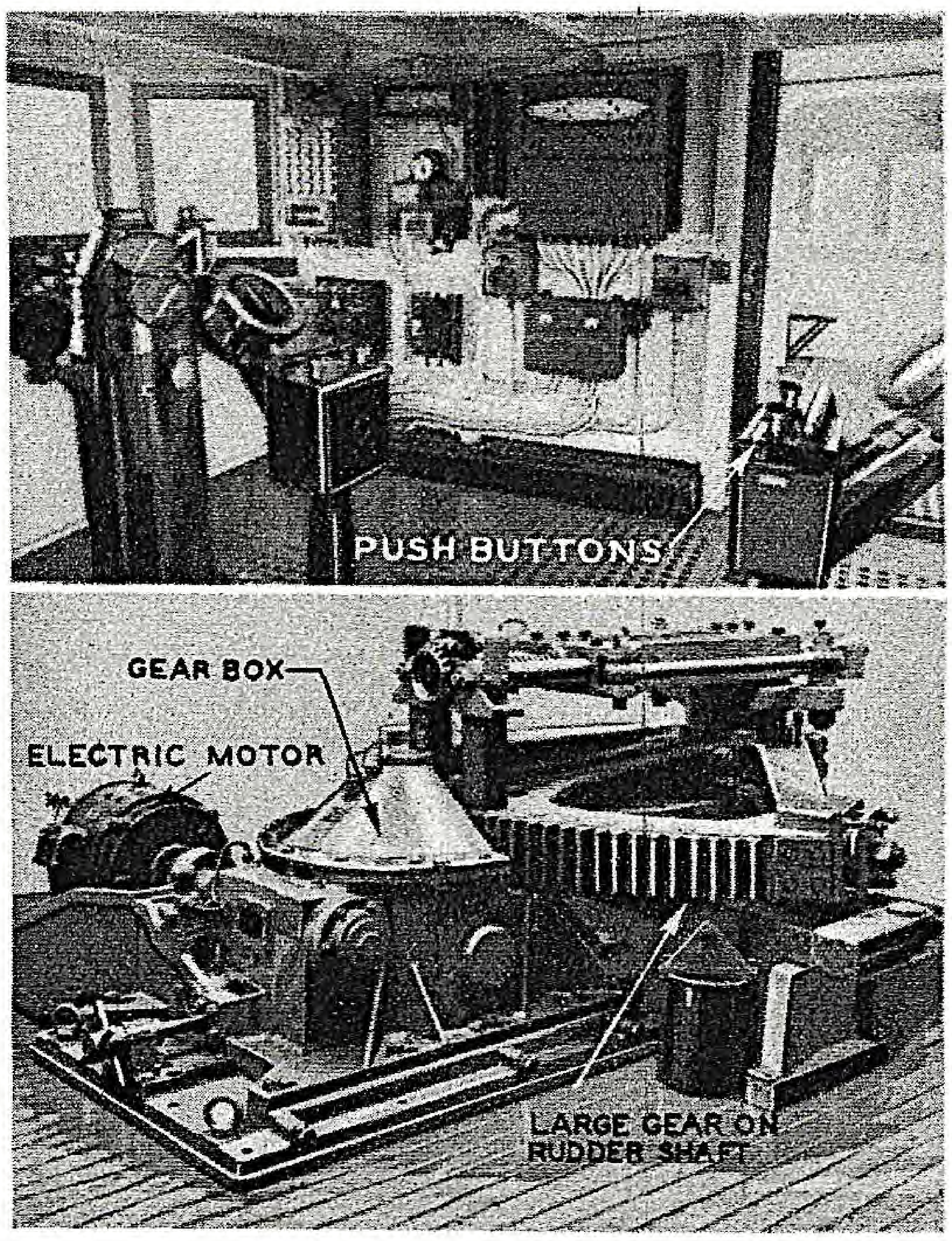
LATEST in lie detectors for criminal work is a unit which makes a permanent record of six different body reflexes. The new apparatus is said to detect falsehoods with more certainty than previous devices which depended on one or perhaps two of the reflexes.

Wavering beams of light record on photosensitive paper the blood pressure, respiration, pulse count, perspiration, speech, and hand movement. A person's perspiration increases under the nervous strain incident to a falsehood, each little variation here being detected by the instrument.



Prevaricators haven't a chance with this "six-in-one" lie detector, demonstrated by W. C. Wideman, of Chicago, Illinois. The subject must answer many questions.

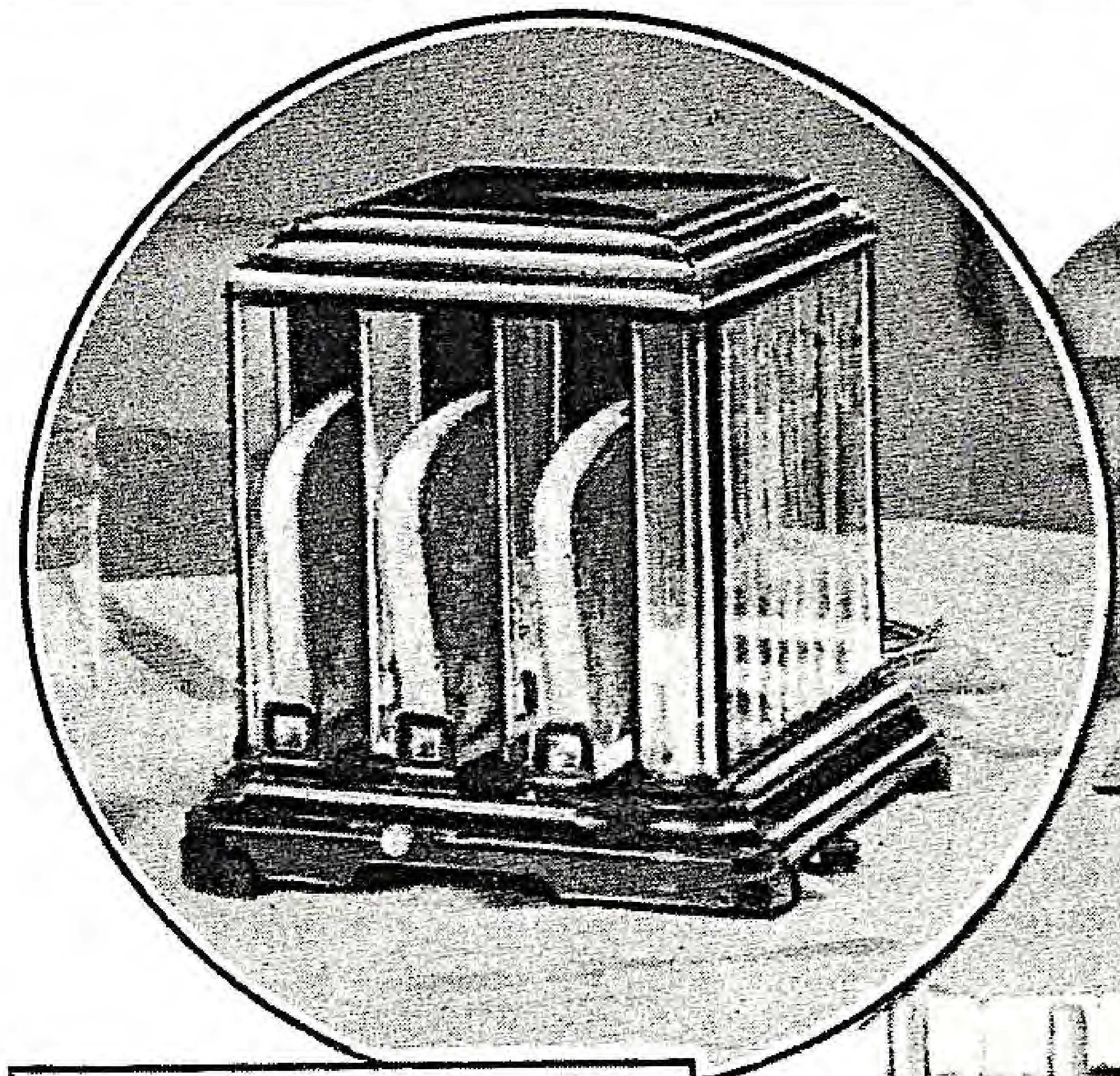
Ship Is Steered By Push Buttons



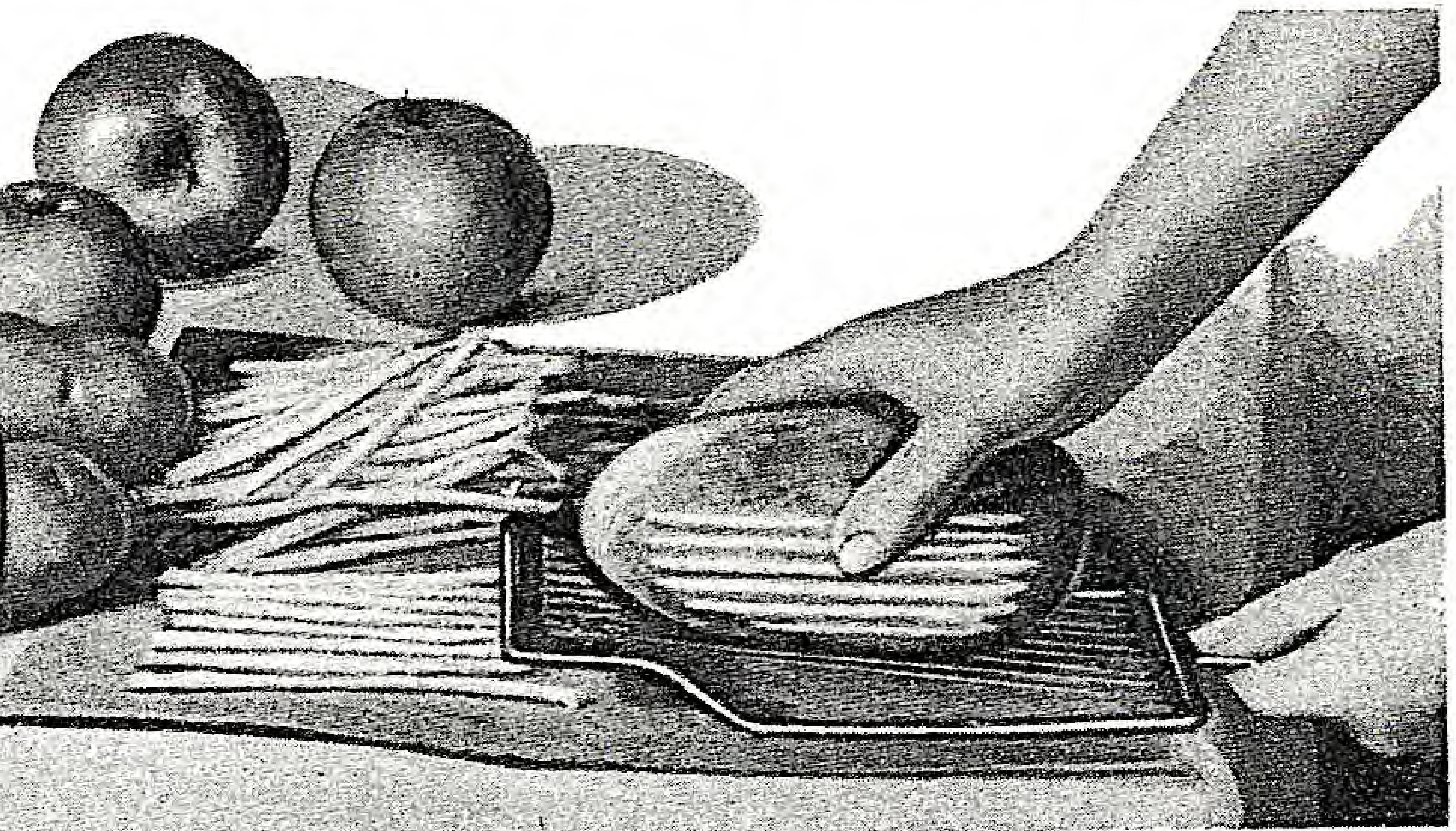
Top: Usual pilot wheel is absent in control room of *Prince Baudoin*, German motor ship. Below—Electric steering device.

THE picturesque pilot wheel which we are accustomed to seeing on the bridge of any ship is absent on the "Prince Baudoin," the first German motor-ship to be equipped with electric steering equipment. Twin push-buttons respond instantly to the helmsman's touch, controlling an electric motor which is geared to the rudder shaft. A second set of steering controls is located at the stern, for use in narrow harbors where there is not room to turn the ship around.

TRIPLE TOASTER, Cabinet Under Sink Among Latest AIDS For Housewife

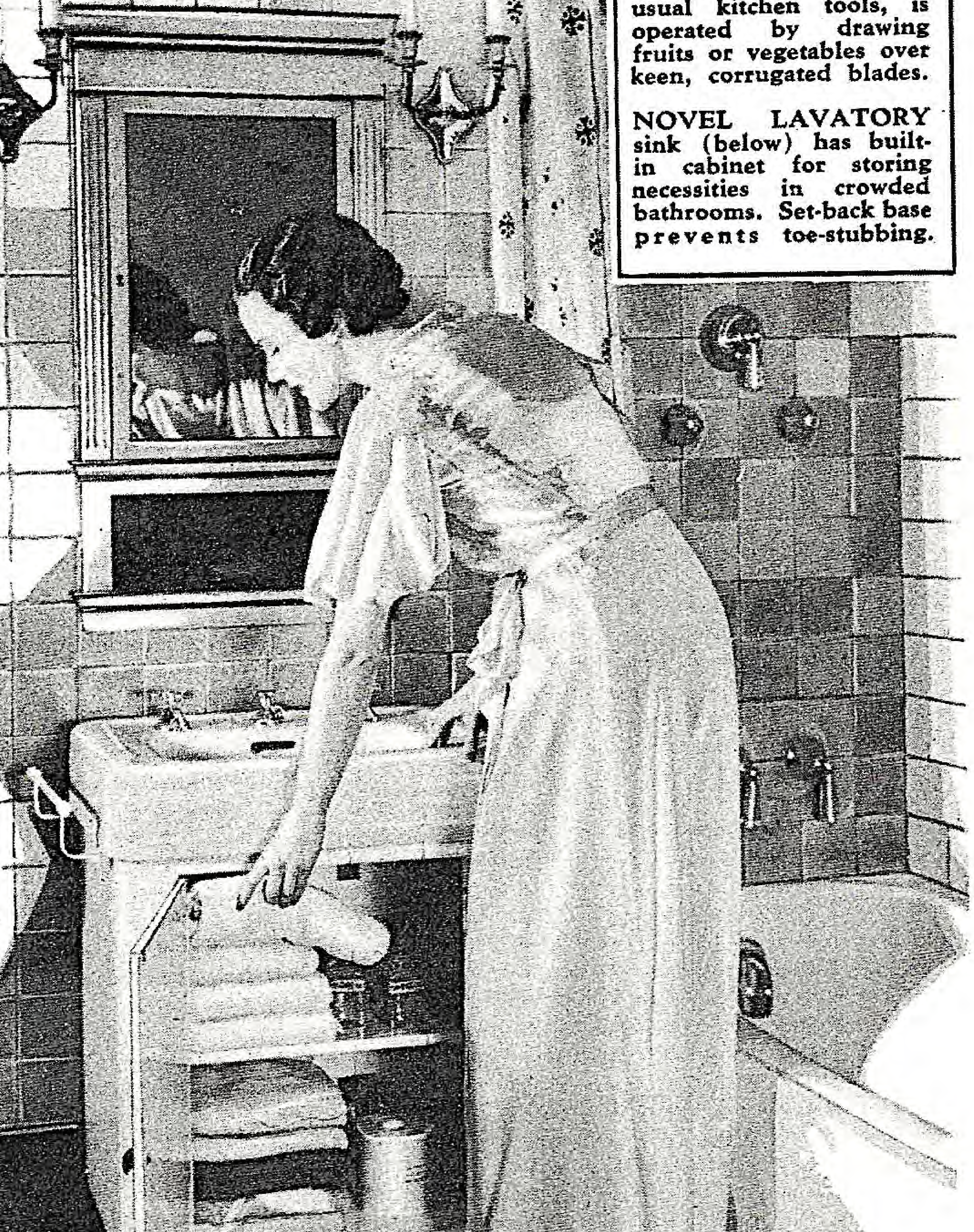


TRIPLE TOASTER not only handles from one to three slices of bread at a time but also keeps toast warm until finally consumed. If only one slice is desired, electric current can be shut off from empty chambers. Asbestos base prevents heat from damaging clockworks.



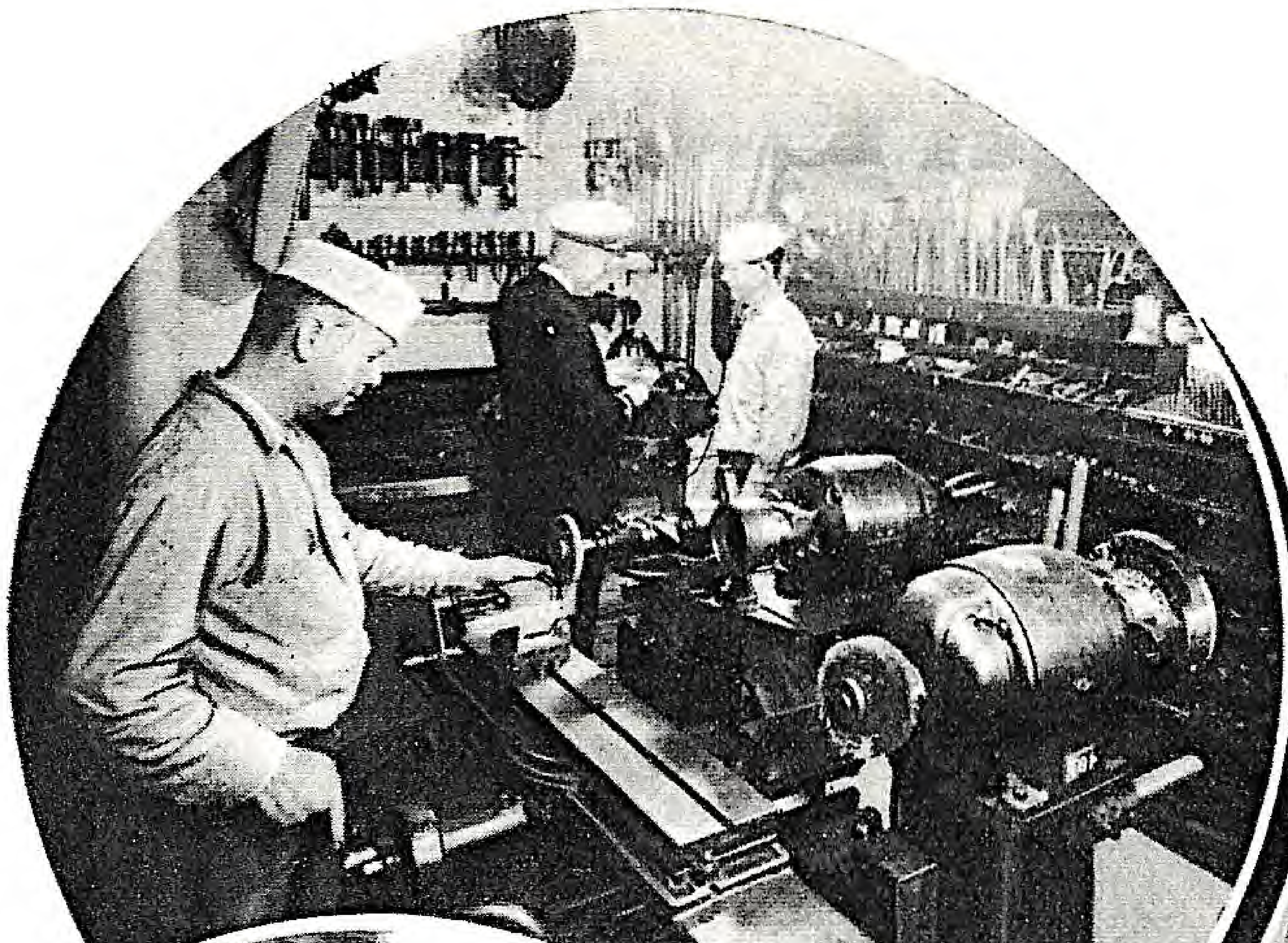
COMPACT FOOD cutter, (above) replacing usual kitchen tools, is operated by drawing fruits or vegetables over keen, corrugated blades.

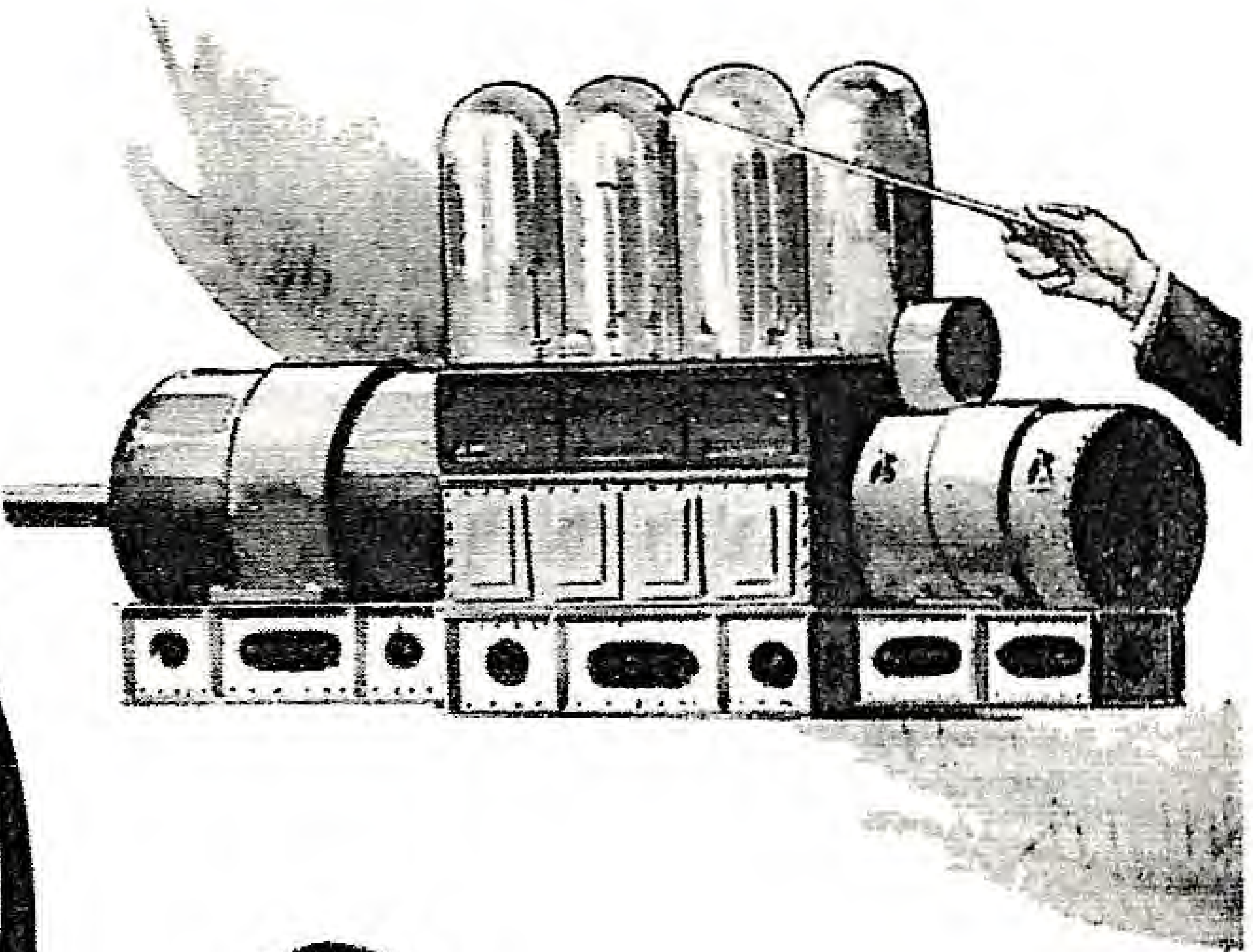
NOVEL LAVATORY sink (below) has built-in cabinet for storing necessities in crowded bathrooms. Set-back base prevents toe-stubbing.



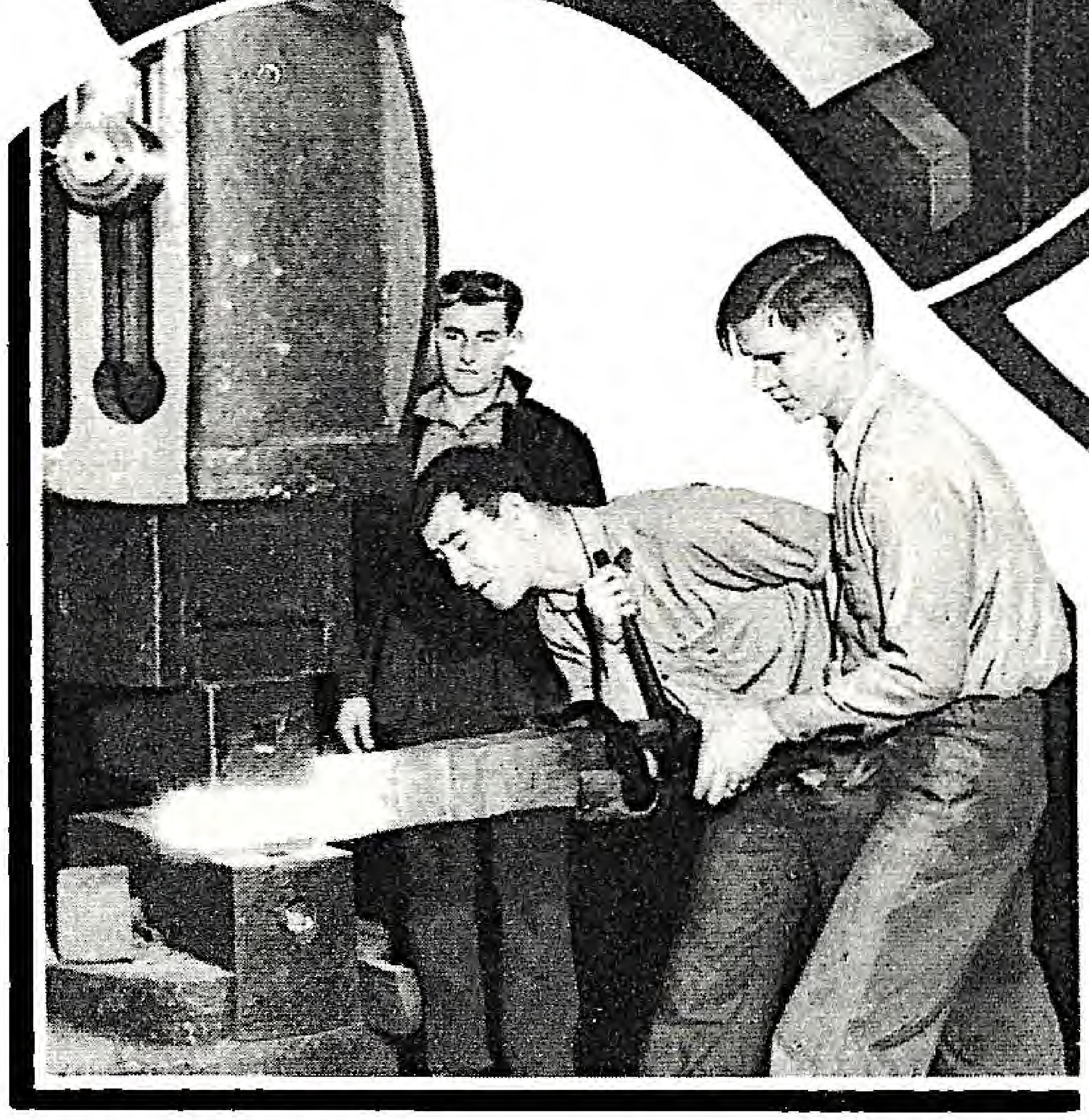
COFFEE BREWER, dialed like radio, permits percolating drink to ten different strengths. When the coffee is done, the percolator shuts off and a red signal light glows. Weak or strong coffee can be served from the same pot simply by turning dial to the appropriate numeral "stop." Even if dial is set at its maximum figure, over-percolated or bitter coffee is an impossibility.

How UNCLE SAM Trains





Butchers, meat inspectors for Uncle Sam's floating fortresses receive training on board ship by working as apprentices. Top left: In machine shops like this, aboard USS VESTAL, student mechanics get practical experience in use of milling cutters, grinders, lathes, and other metal-working machinery.



Student blacksmiths and mechanics aboard USS VESTAL become experienced operators of giant steam hammers, presses.

by BOB GORDON

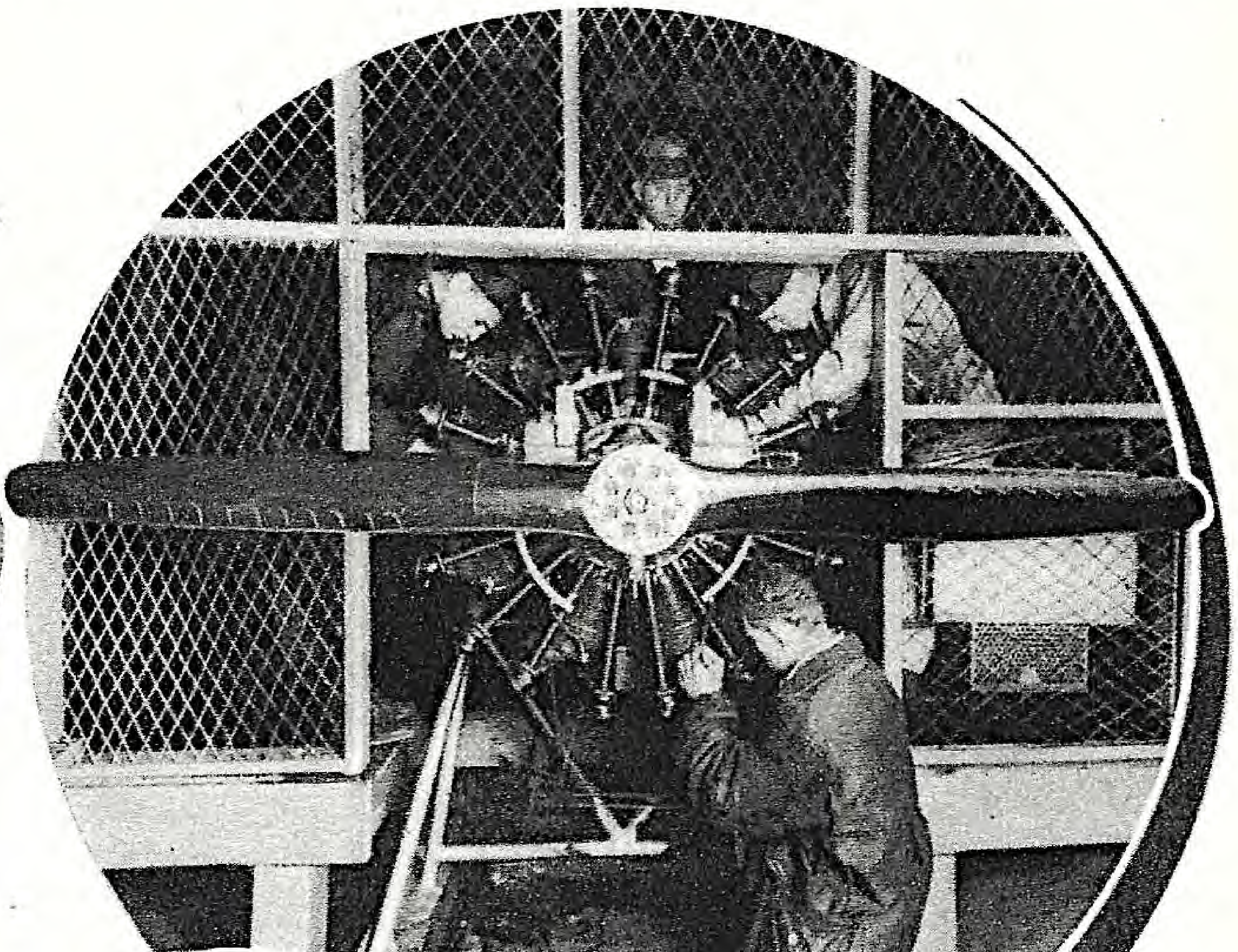
WHEN Uncle Sam needs technically-trained men to man his battleships, air bombers, big guns, radio stations, or even cook meals for his soldiers, he trains them. Each year he selects thousands of young men to be his fighting experts, and develops them for responsible posts in the army and navy. These men are trained to keep his gigantic peace-time war machine running smoothly and efficiently, ready for any emergency.

The best known of Uncle Sam's schools is the Air Corps Training Center at Randolph Field, near San Antonio, Texas. Here young men are paid $75 a month and given free uniforms, board and lodging, while being taught to fly.

The qualifications for obtaining this instruction are high. A candidate must be in perfect physical condition and must have recently completed at least two years in college. Appointments are made from those who apply to the War Department.

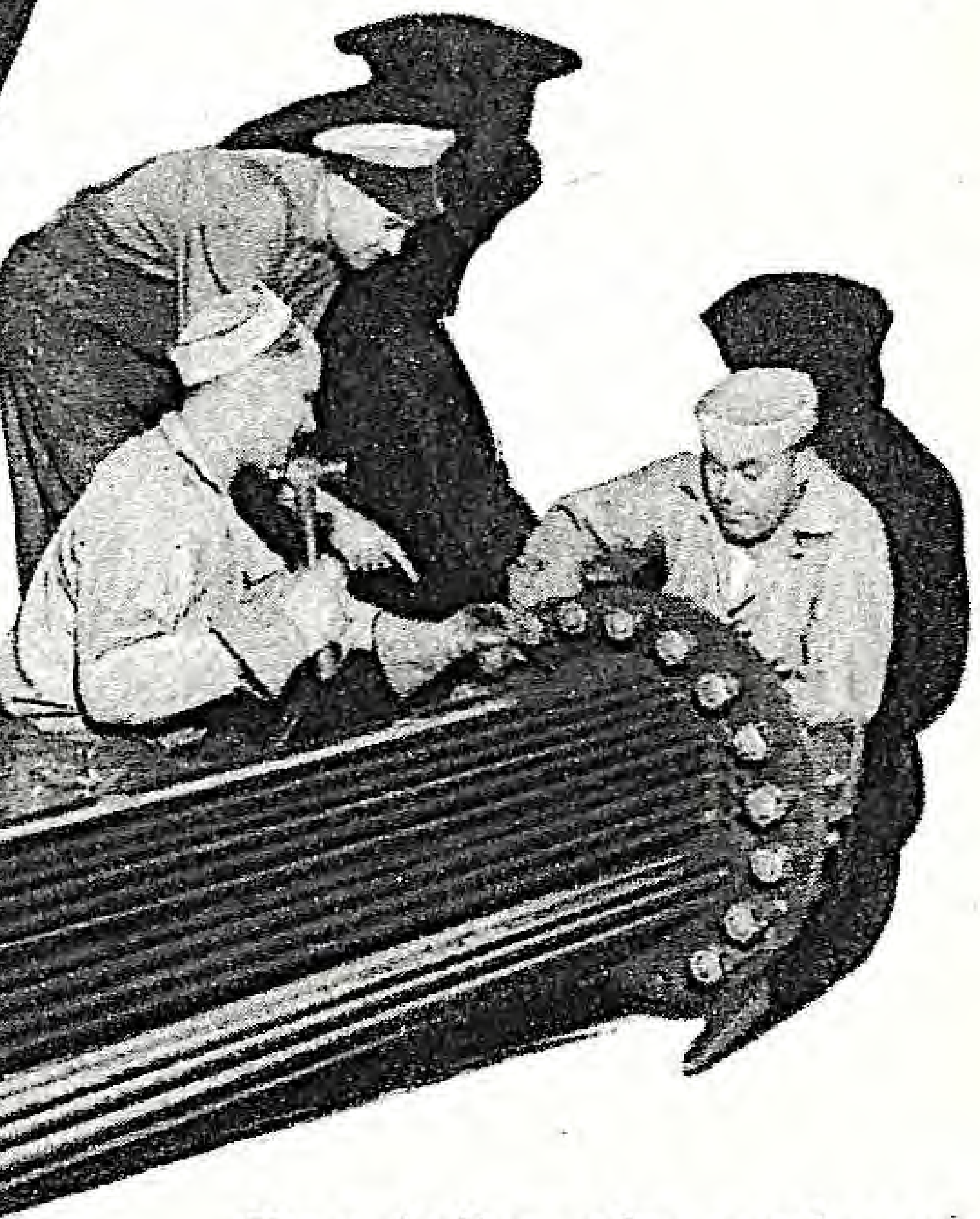
Everyone, of course, can't be an airplane pilot. There are many other trades that are taught by Uncle Sam. At Rantoul, Illinois, trades now being taught there to enlisted men include: airplane mechanic, radio operator and mechanic, aircraft machinist, aircraft welder, armorer, parachute rigger and photography. Enlisted men detailed to these

His FIGHTING EXPERTS



At Rantoul, Illinois, enlisted men receive training as airplane mechanics. Aviation engines are mounted on these test stands for student study.

Welding is just another of the many trades taught in government technical schools. Graduates of four-month cooking and baking courses turn out cakes like above.



Even boiler tube repairs are made in machine shops aboard ships by Uncle Sam's students.

courses must have the equivalent of four years' high school education.

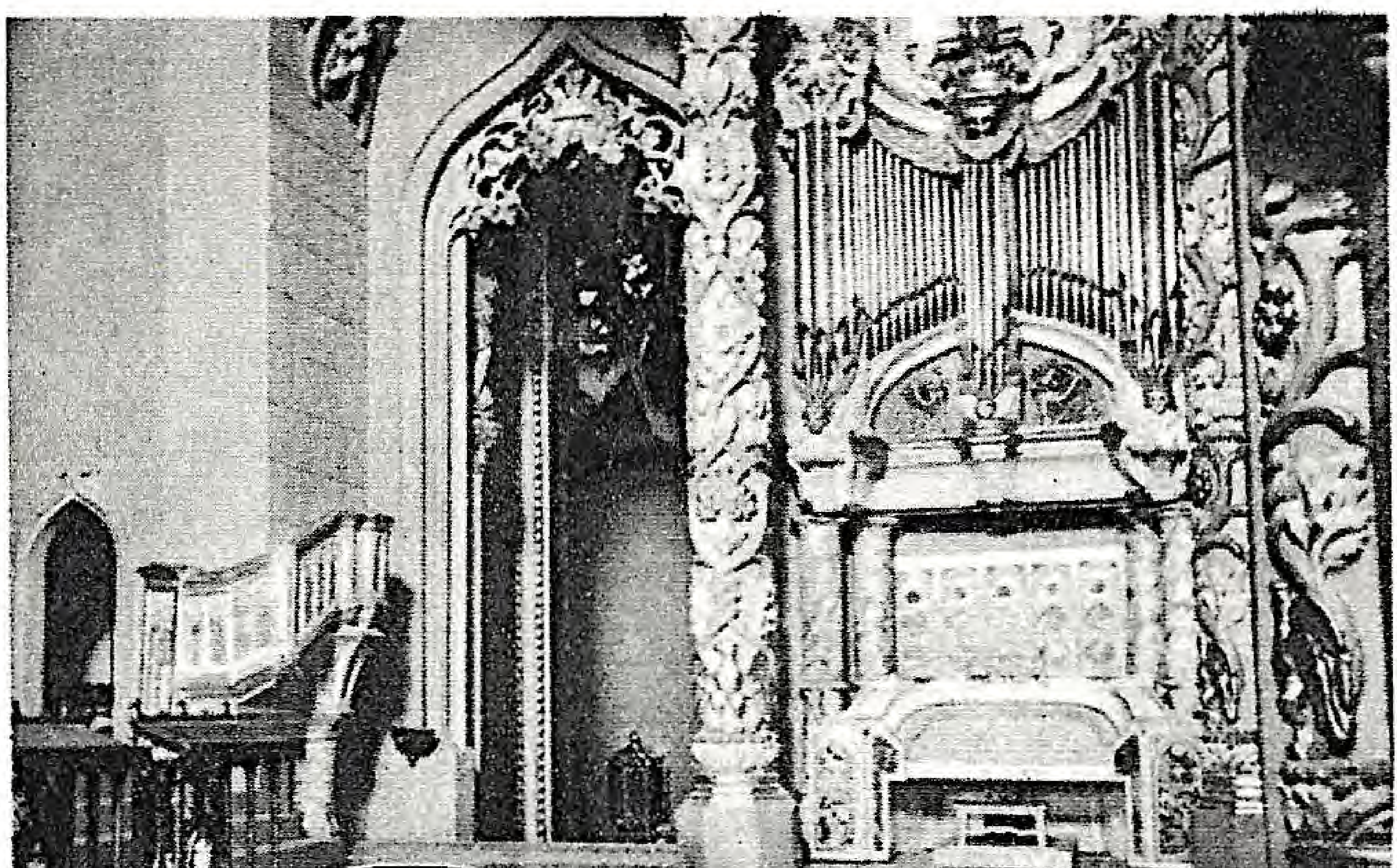
The Navy operates a similar aviation school at Great Lakes, Illinois, but its course is more general; the graduates specialize in the jobs they do best after finishing the basic work.

Running a close second to the Air Corps Schools are the Army Signal Corps courses taught at Fort Monmouth, New Jersey. The radio course includes code practice, theory, installation, maintenance, testing and typing. Most Army operators can take from 40 to 50 words a minute, typing the messages direct.

Other Signal Corps courses train men to be telephone and telegraph operators and electricians. The Meteorological Forecasters' School is perhaps the only practical course

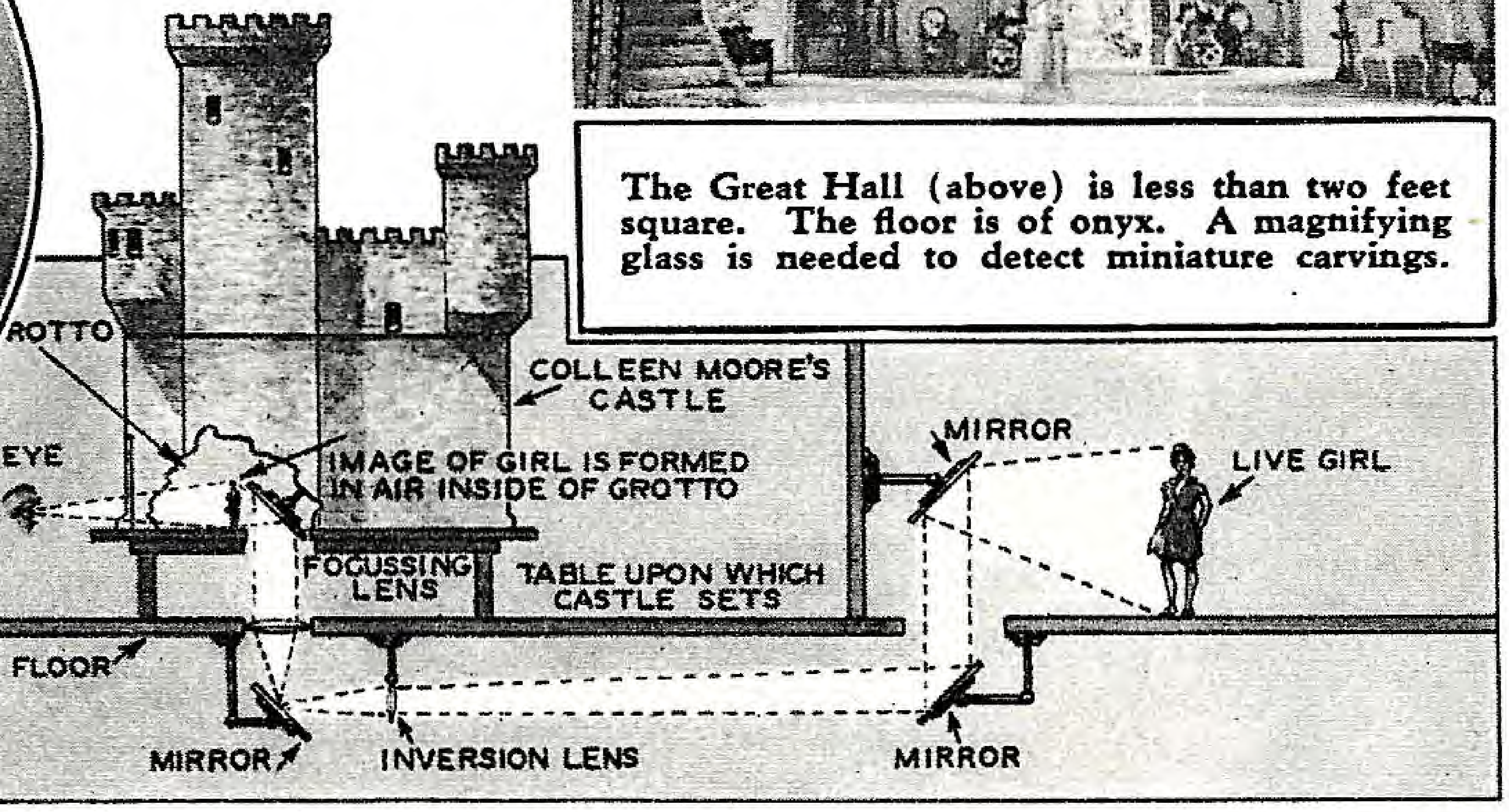
[*Continued on page* 144]

Film Star's Mechanical Doll House Is World's Costliest Toy



Above—The cathedral organ, 15 inches high, plays by remote control.

The Great Hall (above) is less than two feet square. The floor is of onyx. A magnifying glass is needed to detect miniature carvings.



Circle—Colleen Moore, owner of the doll house. Diagram (not to scale) shows how ancient optical trick was used to project six-inch image of real girl into a grotto in the castle garden.

MORE than 700 persons, working during a nine-year period, were required to construct Colleen Moore's $435,000 doll house which soon will be exhibited in every important city in the United States and Europe.

The model house boasts a running water system, a miniature library of 700 thumbnail size books, a 15-inch pipe organ which really plays and over 3,000 other objects built to scale. Tiny lights, smaller than a grain of wheat, provide the illumination for the eleven rooms. On the walls of the library and other rooms are paintings by noted artists.

Only the finest materials available were used throughout the nine-foot castle. Among the costly materials employed were two tons of aluminum and copper, large quantities of bronze and silver, 40 pounds of gold, inlaid woods, carved ivory, mother-of-pearl, onyx, crystal, amber, emeralds, rubies and diamonds. No expense was spared in making the model perfect in every detail. A three-year schedule of bookings is expected to yield over $1,000,000 in proceeds which will be donated to children's hospitals.

Spout Holds Spoonful of Sugar

A NEW hygienic sugar dispenser, which pours exactly one teaspoonful of sugar each time it is tripped, has just been invented. A second helping can be obtained only by returning the sanitary food container to its normal upright position.

Sugar dispenser pours like tea-pot.

Converted Autos Run On Crankcase Oil

"GOT any crankcase drainings or old oil?" asked the driver of a Model A Ford at a California gas station.

The attendant pointed to a fifty-gallon drum of dirty black liquid. "There's plenty of it there—it's not much good, though."

Dipping out a pailful of the refuse, the driver began pouring it into his gas tank.

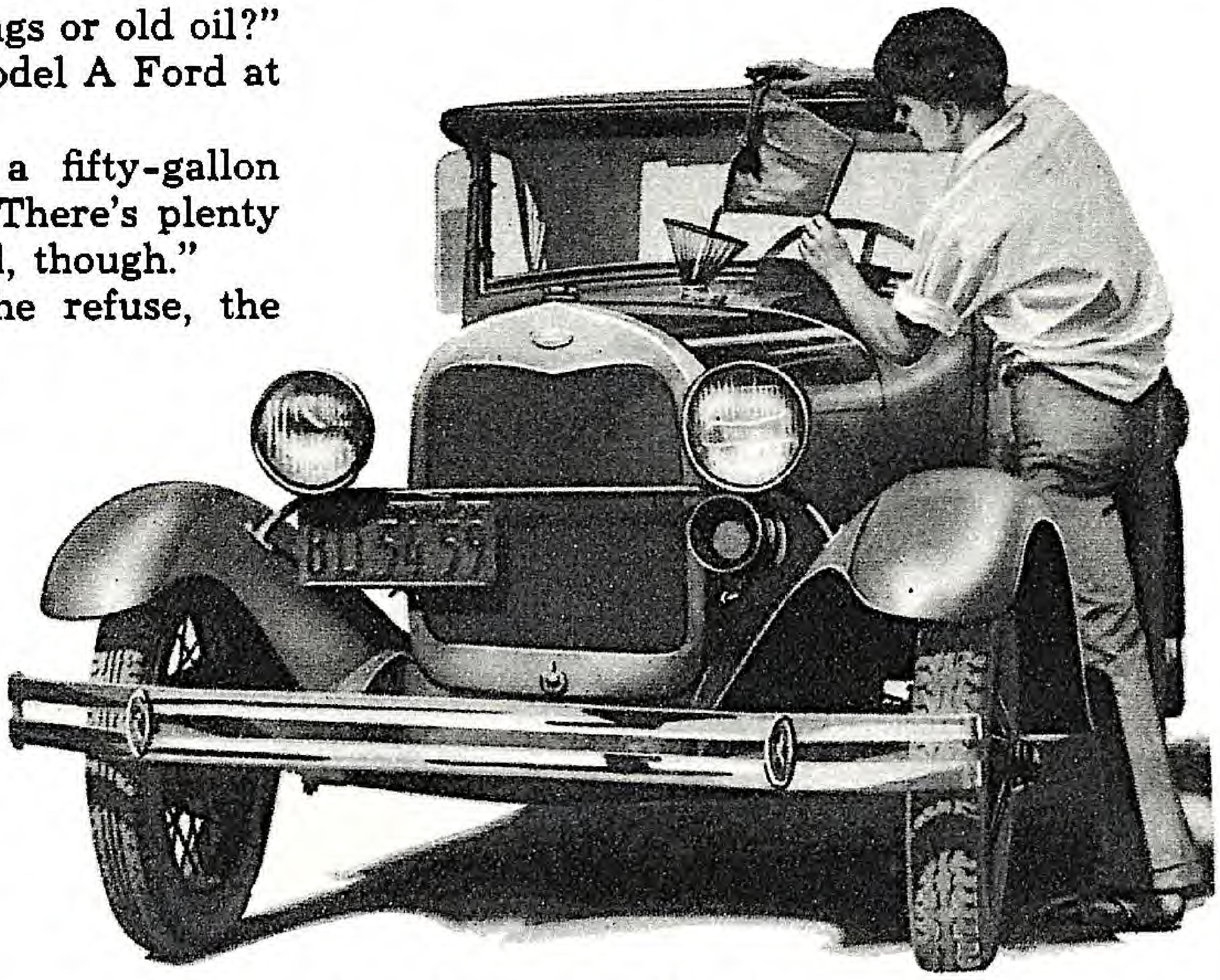
"Hey! You can't do that—it's oil, not gasoline!" shouted the attendant.

The above scene, with but little variation, has been reenacted scores of times as the owner of this Dieselized Ford, a Los Angeles mechanic, toured the Sierras using fuel costing less than five cents a gallon.

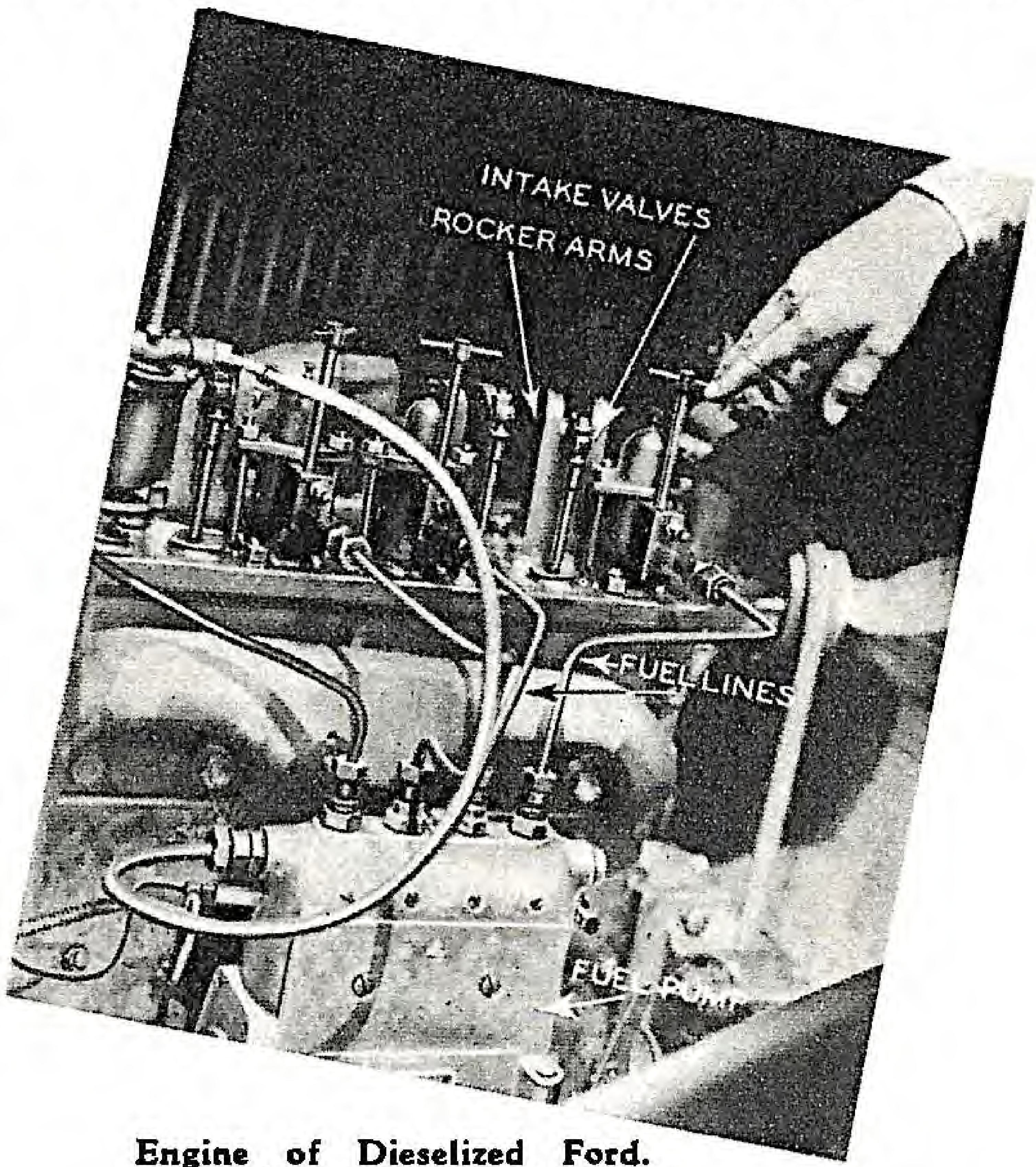
Carburetor, ignition system, and head of this Ford were discarded. Leaving the exhaust valves as they were, overhead intake valves were installed in the new head. The cam shaft drives a standard Bosch fuel pump.

No other changes were made, except to use a 12-volt battery for starting. Top speed is about 77 miles an hour.

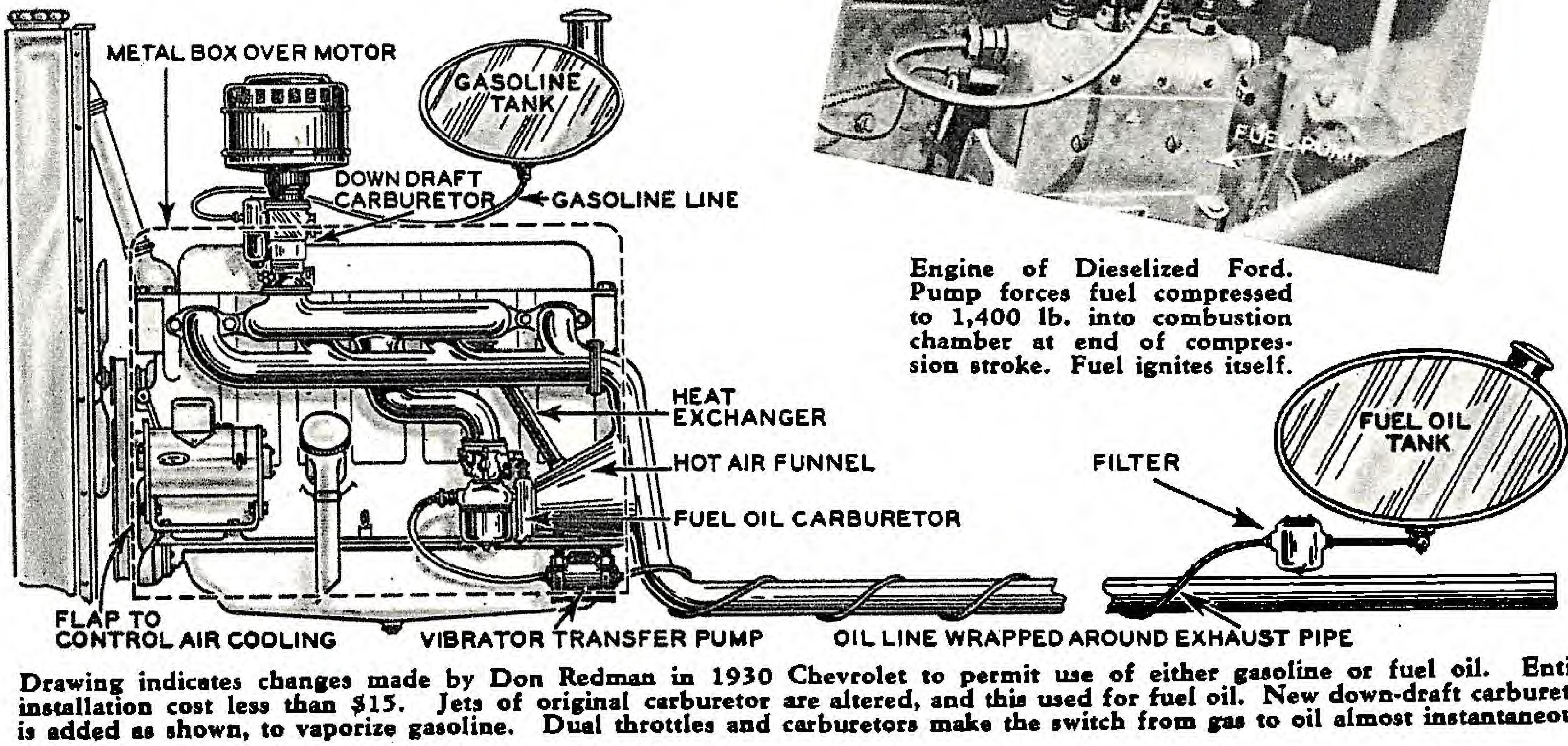
It is not necessary, however, to completely Dieselize an engine in order to use low-cost fuels. Don Redman, another Los Angeles experimenter, has installed in his 1930 Chevrolet a dual fuel system, which permits use of gasoline for starting and heating the motor, fuel oil for running.



Tank of this Dieselized Model A Ford is filled with crankcase drainings, not gasoline. In towing large car from Phoenix to Los Angeles, driver made 26 miles per gallon of fuel oil.

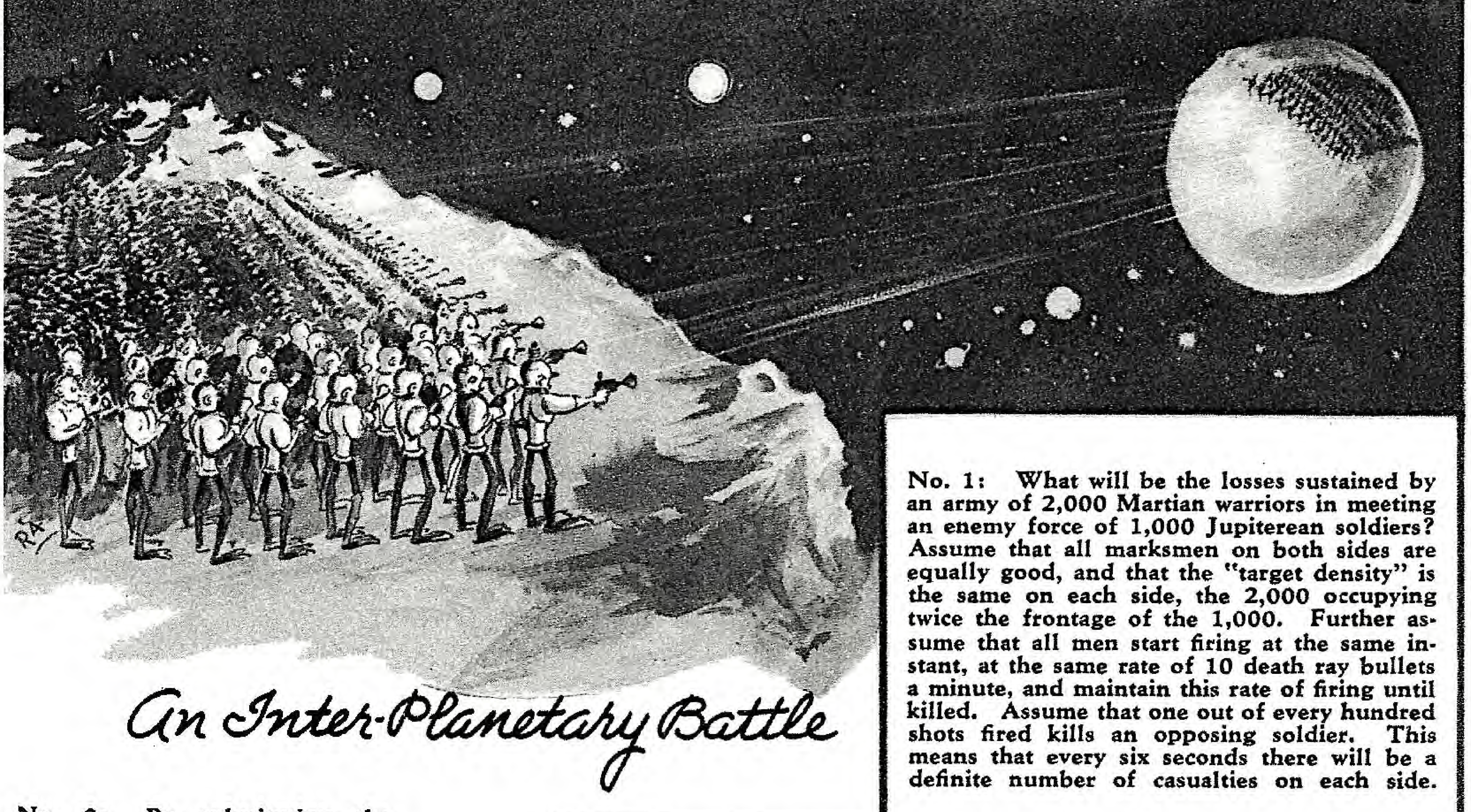

INTAKE VALVES
ROCKER ARMS
FUEL LINES
FUEL PUMP

Engine of Dieselized Ford. Pump forces fuel compressed to 1,400 lb. into combustion chamber at end of compression stroke. Fuel ignites itself.


METAL BOX OVER MOTOR
GASOLINE TANK
DOWN DRAFT CARBURETOR
GASOLINE LINE
HEAT EXCHANGER
HOT AIR FUNNEL
FUEL OIL CARBURETOR
FILTER
FUEL OIL TANK
FLAP TO CONTROL AIR COOLING
VIBRATOR TRANSFER PUMP
OIL LINE WRAPPED AROUND EXHAUST PIPE

Drawing indicates changes made by Don Redman in 1930 Chevrolet to permit use of either gasoline or fuel oil. Entire installation cost less than $15. Jets of original carburetor are altered, and this used for fuel oil. New down-draft carburetor is added as shown, to vaporize gasoline. Dual throttles and carburetors make the switch from gas to oil almost instantaneous.

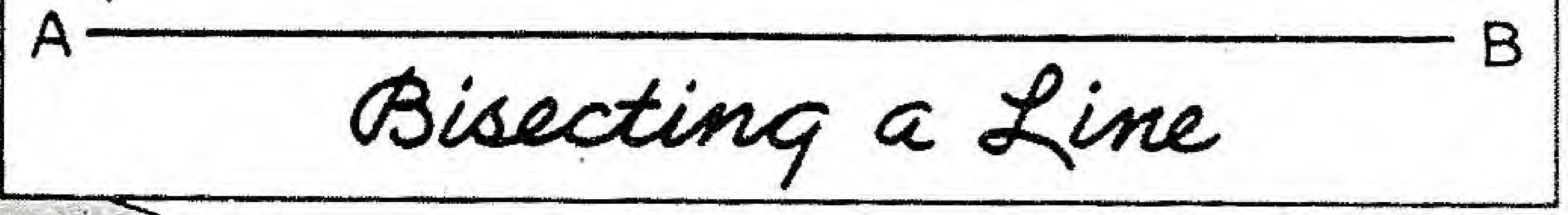
PRIZES for PROBLEM Solutions;



An Inter-Planetary Battle

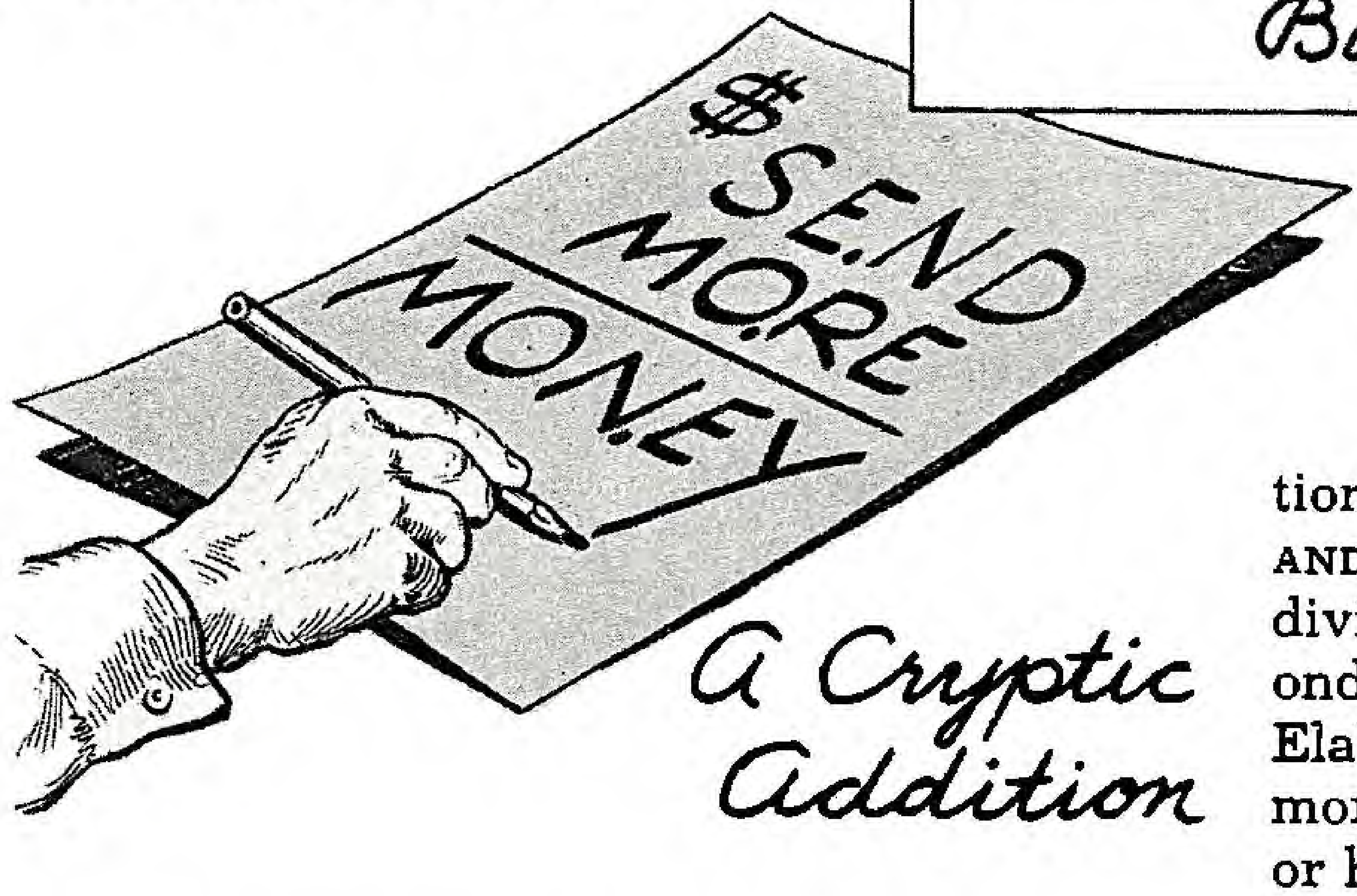
No. 1: What will be the losses sustained by an army of 2,000 Martian warriors in meeting an enemy force of 1,000 Jupiterean soldiers? Assume that all marksmen on both sides are equally good, and that the "target density" is the same on each side, the 2,000 occupying twice the frontage of the 1,000. Further assume that all men start firing at the same instant, at the same rate of 10 death ray bullets a minute, and maintain this rate of firing until killed. Assume that one out of every hundred shots fired kills an opposing soldier. This means that every six seconds there will be a definite number of casualties on each side.

No. 2: By substituting the proper numerals for the letters in the cryptic message at the right, find how much money the student needed to pay his bills.



Bisecting a Line

No. 3: Using a pair of compasses only—no ruler, triangle, or pencil—find the exact middle point of the above line AB. Show your construction clearly, and list, in order, the steps taken to get the result. Your line need not be exactly the same length as that shown.



A Cryptic Addition

THE importance of the military principle of concentration of forces is clearly shown by the rather surprising answer to the first problem in this month's mathematical contest. This is a straight-forward problem, but there are a number of different ways of arriving at the answer, some short, some long and tedious.

For those who enjoy drawing circles with a compass, a simple but interesting little problem in geometry is included. It will look easy at first, grow harder as you puzzle along trying to discover the secret, then appear easy again when the answer is finally obtained.

For the simplest and most accurate solutions to all three problems Modern Mechanix and Inventions offers $25.00 in cash prizes, divided as follows: First prize, $10.00; second $5.00; and ten third prizes of $1.00 each. Elaborate, artistic solutions will receive no more consideration than neatly typewritten or hand-written entries.

Contestants should give age, occupation, and education, though this information will not be considered in awarding the prizes.

Your entry should be postmarked before May 25, 1935. Decisions of the judges will be final, and no entries will be returned. In case of ties, duplicate prizes will be awarded. Answers to these problems and names of the the winners will appear in the August issue.

Employes of this magazine or their relatives are not eligible to compete. You don't have to buy a copy or be a subscriber to enter. Address Problems Contest, Modern Mechanix and Inventions, 529 South Seventh St., Minneapolis, Minnesota.

NOVELTY ENTRANTS win $125

WINNERS of the $125.00 in cash prizes offered in the February, 1935 MM Home Novelty Contest are announced on this page. This contest is the third in a series of four offering to Modern Mechanix and Inventions readers a total of $500.00 for home improvement ideas. Winners in the fourth contest will be announced next month.

From the flood of entries, many including photographs or even the completely-built project, the judges picked that of Dan B. Blair as winner of the first prize of $60.00.

His plans and article are reproduced here.

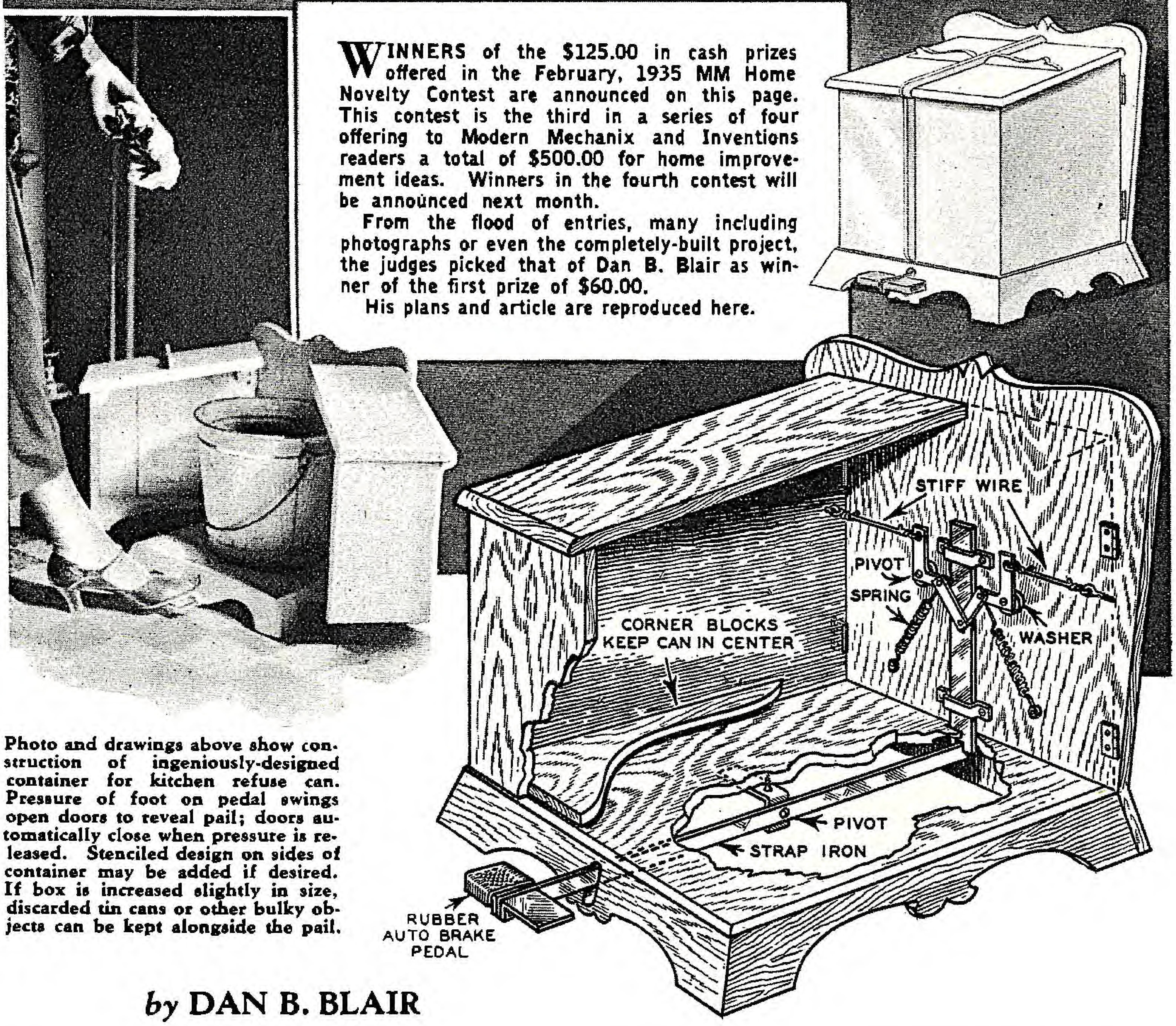


Photo and drawings above show construction of ingeniously-designed container for kitchen refuse can. Pressure of foot on pedal swings open doors to reveal pail; doors automatically close when pressure is released. Stenciled design on sides of container may be added if desired. If box is increased slightly in size, discarded tin cans or other bulky objects can be kept alongside the pail.

by DAN B. BLAIR

THIS attractive yet inexpensive box for concealing the garbage and refuse pail serves a long-felt want of the housewife who enjoys a neat kitchen. It is easily constructed from scrap material, wood and iron, which can be found in most any home workshop.

The cover can be operated even when both hands are full, simply by pressing the foot pedal. Both doors swing open to reveal a standard size home garbage can, and close automatically when the foot pedal is released.

No dimensions are given for the box, since this will vary with the size and type of can used. Follow the design shown in the sketches, using white pine throughout. Finish with varnish or enamel in a color which will harmonize with that of other furnishings in your own kitchen.

HOME NOVELTY CONTEST WINNERS

The following persons, selected as winners in the February, 1935, MODERN MECHANIX AND INVENTIONS Home Novelty Contest, have been awarded the $125.00 in cash prizes offered for practical ideas.

FIRST PRIZE, $60.00: Dan B. Blair, Atlanta, Ga. His winning entry appears on this page.

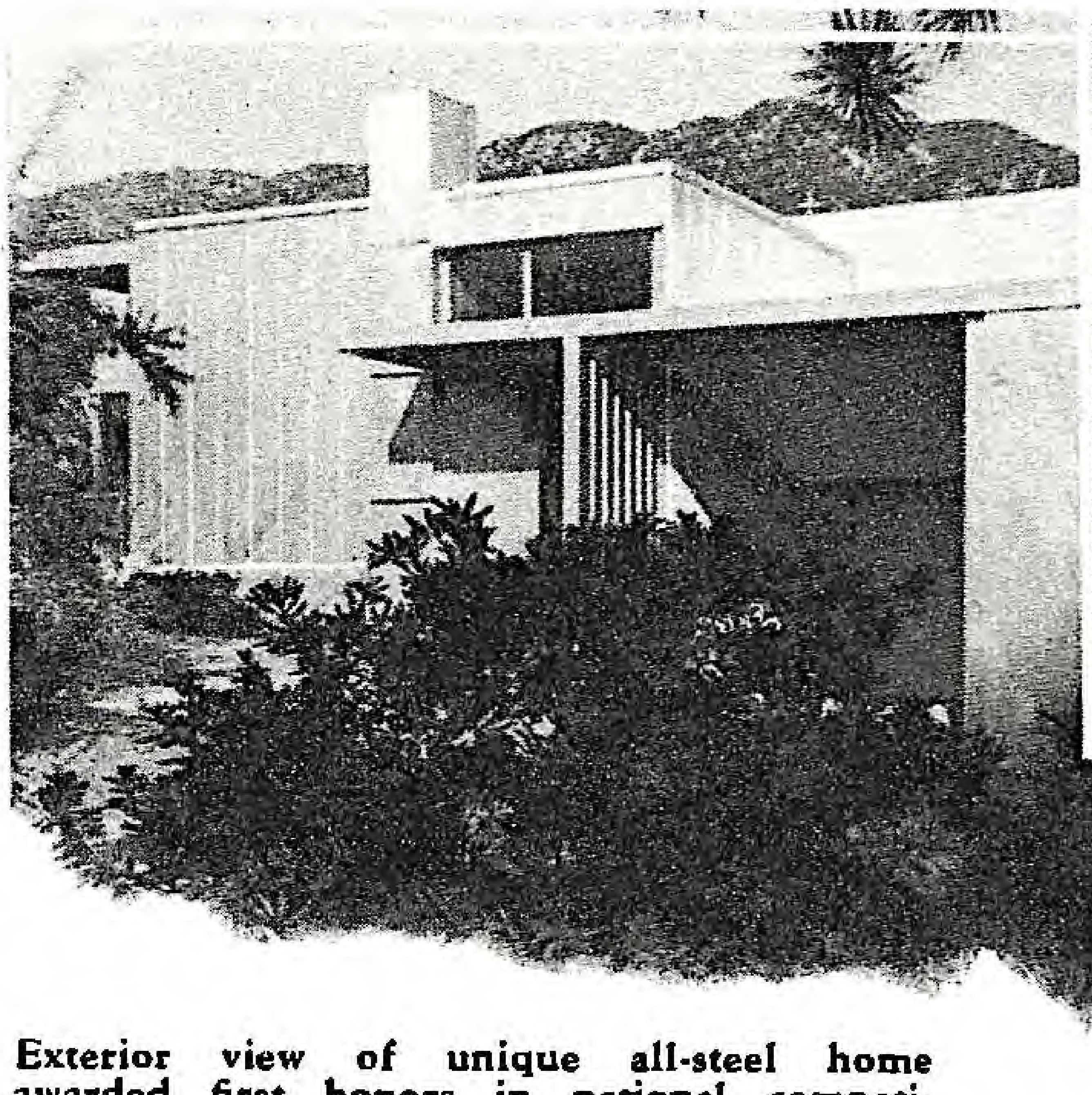
SECOND PRIZE, $20.00: Walter Lindeman, Iron River, Mich.—A novelty child's rolling toy.

THIRD PRIZE, $8.00: F. V. Lant, West Brighton, N. Y.—Metal lighthouse lamp.

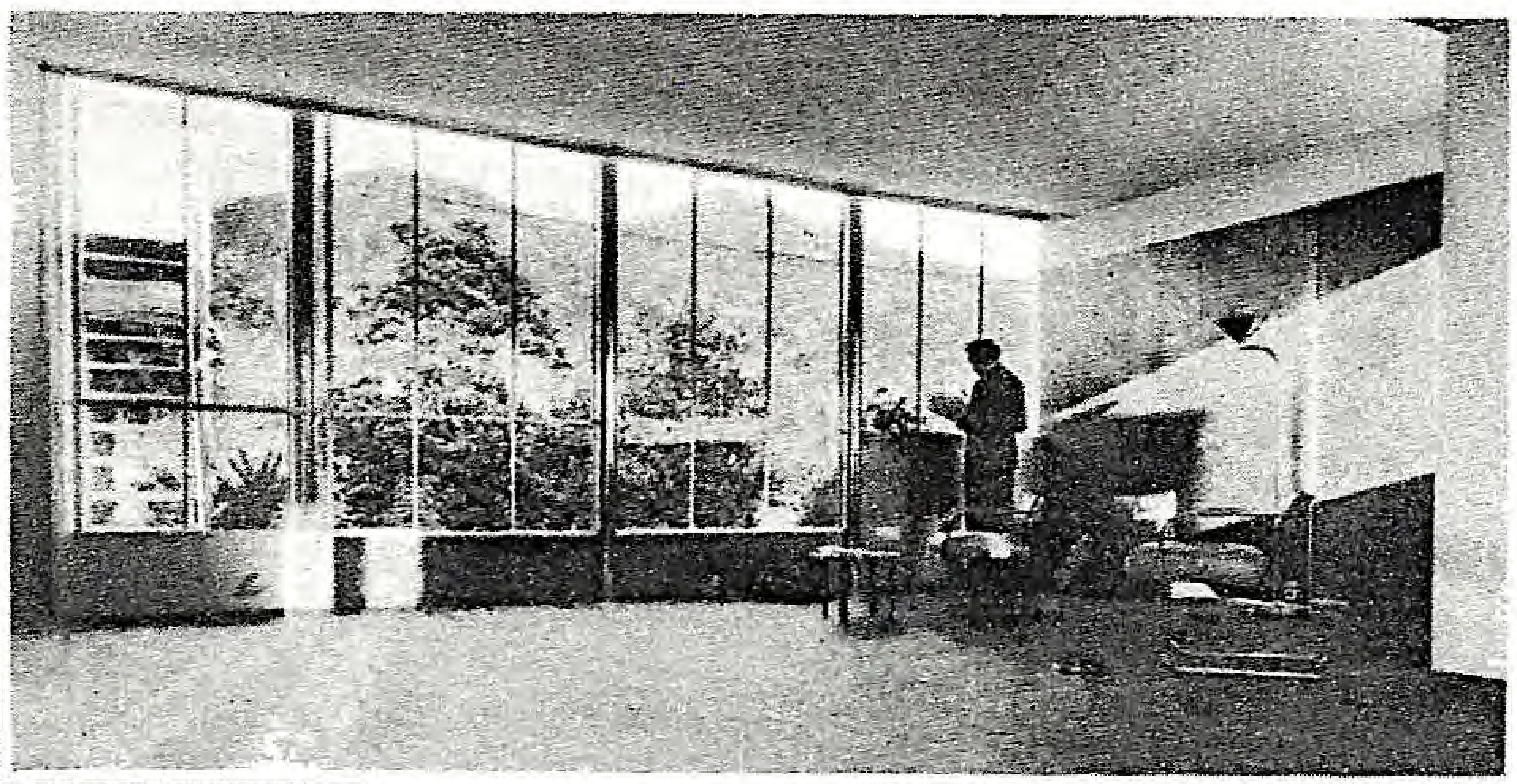
FOURTH PRIZE, five of $5.00 each: C. N. Bruce, New Castle, Pa.—Nut-cracking anvil and hammer; E. Loudermilk, Lewisburg, W. Va.—"Scotty" book ends; E. S. Randolph, Chicago, Ill.—Modernistic sewing box; Fred von Kaenel, Denver, Colo.—Cocoanut shell clock; D. C. Marshall, Manhattan, Kans. —Log cabin book ends.

FIFTH PRIZE, six of $2.00 each: T. O. Johnson, Whitman, Mass. — Beverage tray; Bob Warner, Drummond, Wisc.—Burned wood novelties; Paul Krichbaum, Battle Creek, Mich.—Cigarette machine gun; L. A. Croft, Provo, Utah—Windmill radio lamp; A. D. Bequette, Cottonwood, Ariz.—Photo statuettes; J. W. Timmons, Emporia, Kans.—Cigarette holder.

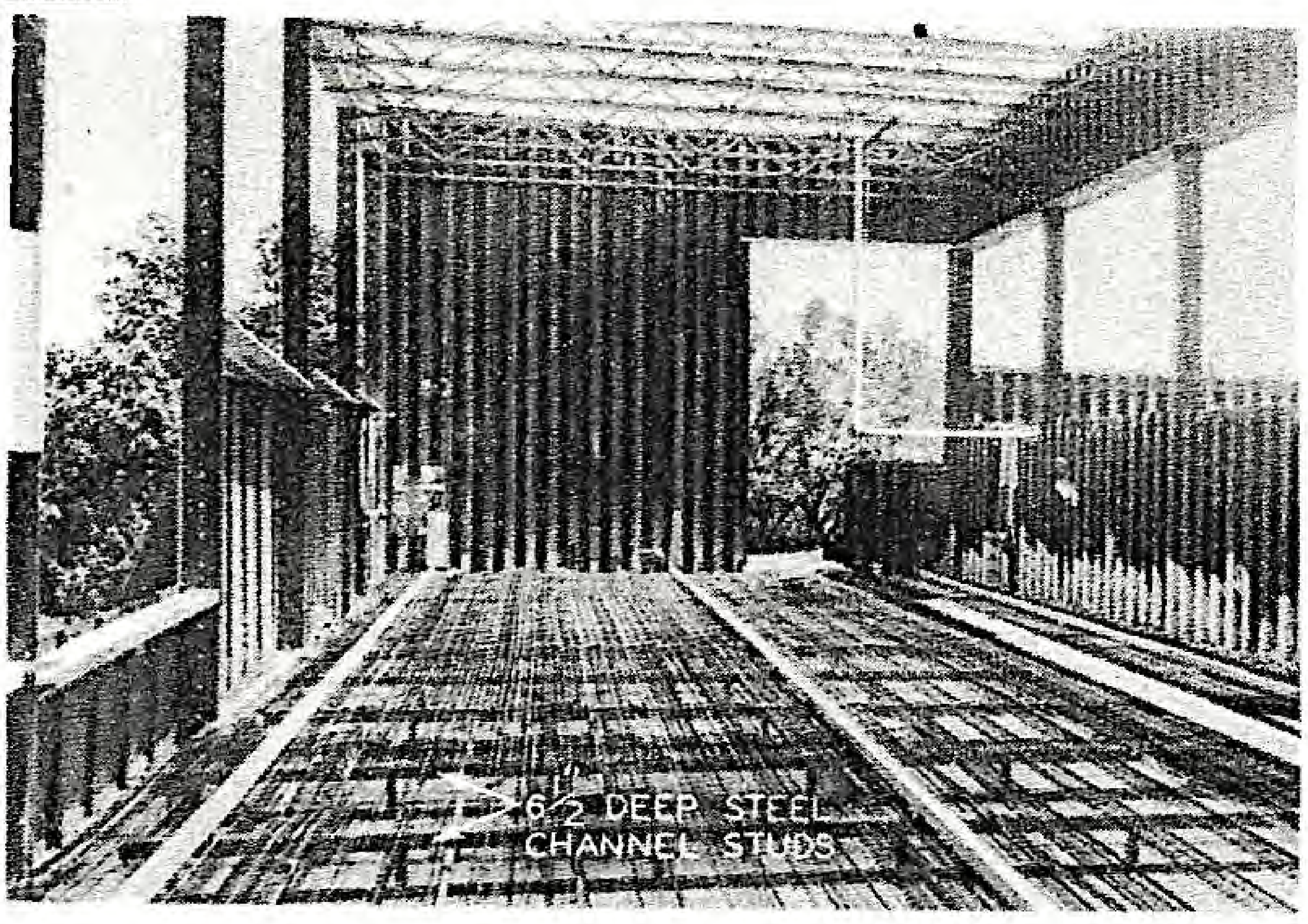
Floors Are Radiators In New Steel Home



Exterior view of unique all-steel home awarded first honors in national competition. Aluminum paint reflects the sun's rays.



Windows in this modernistically-furnished steel home slide back into walls to make open-air rooms.



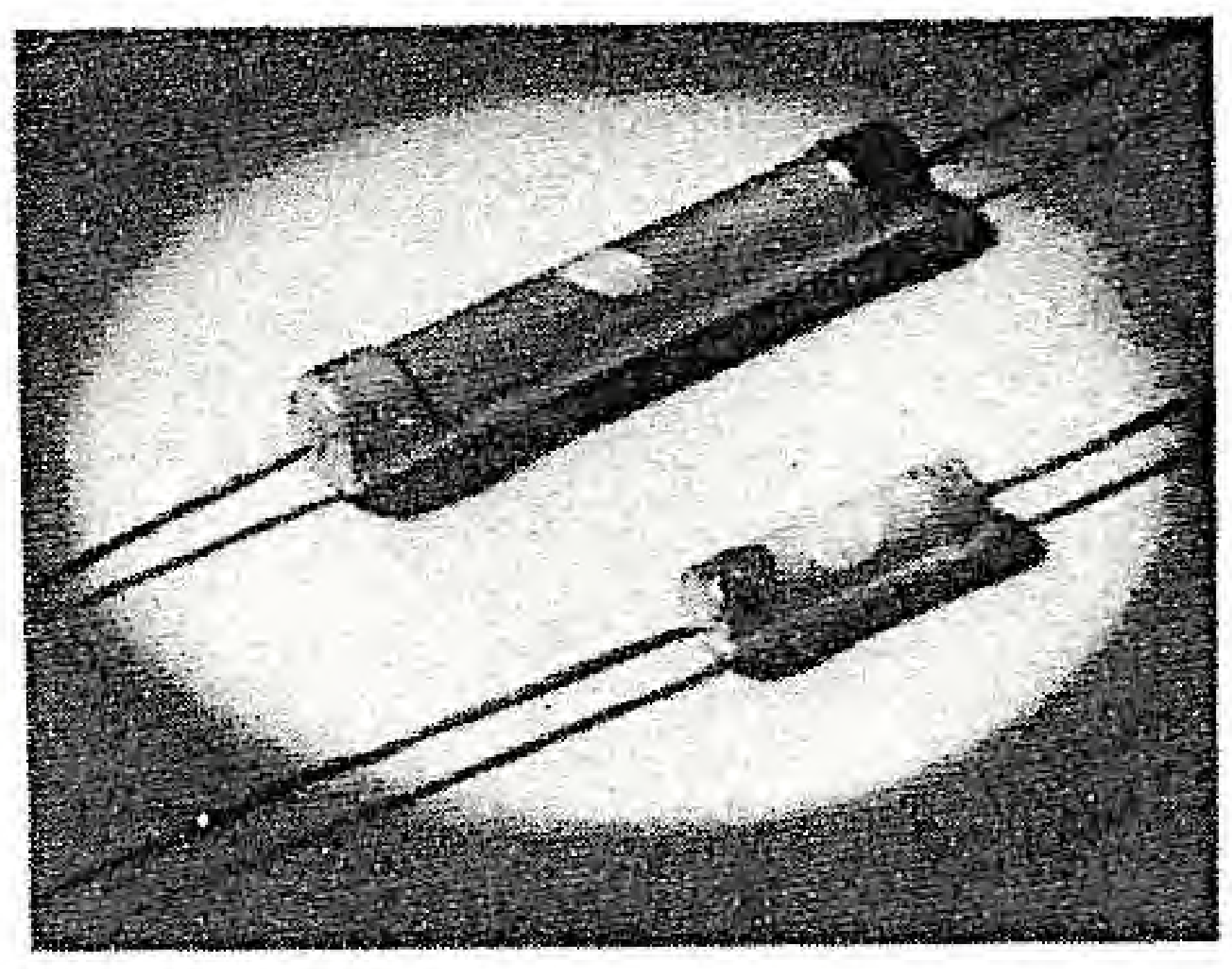
Two-inch layer of beautifully colored concrete is laid over cellular steel framework of ground floor. Hot air passing between steel trusses radiates heat upward through the floor.

A UNIQUE double floor which eliminates entirely the need for radiators is just one of the many features of an all-steel house designed by Richard J. Neutra, Los Angeles architect. Hot air from gas furnaces is passed between the floor, then up through the walls to a vent in the attic which is just large enough to maintain a slow movement of air.

In a nation-wide Better Homes of America competition this home design won the first award and a gold medal for the best house constructed in the last five years. First mention was given to two other houses designed by the same architect.

The new method of heating utilizes direct radiation, giving body comfort independently of the air temperature in the room. It is claimed that the indoor temperature can be as low as 20 degrees F. without causing discomfort in the home.

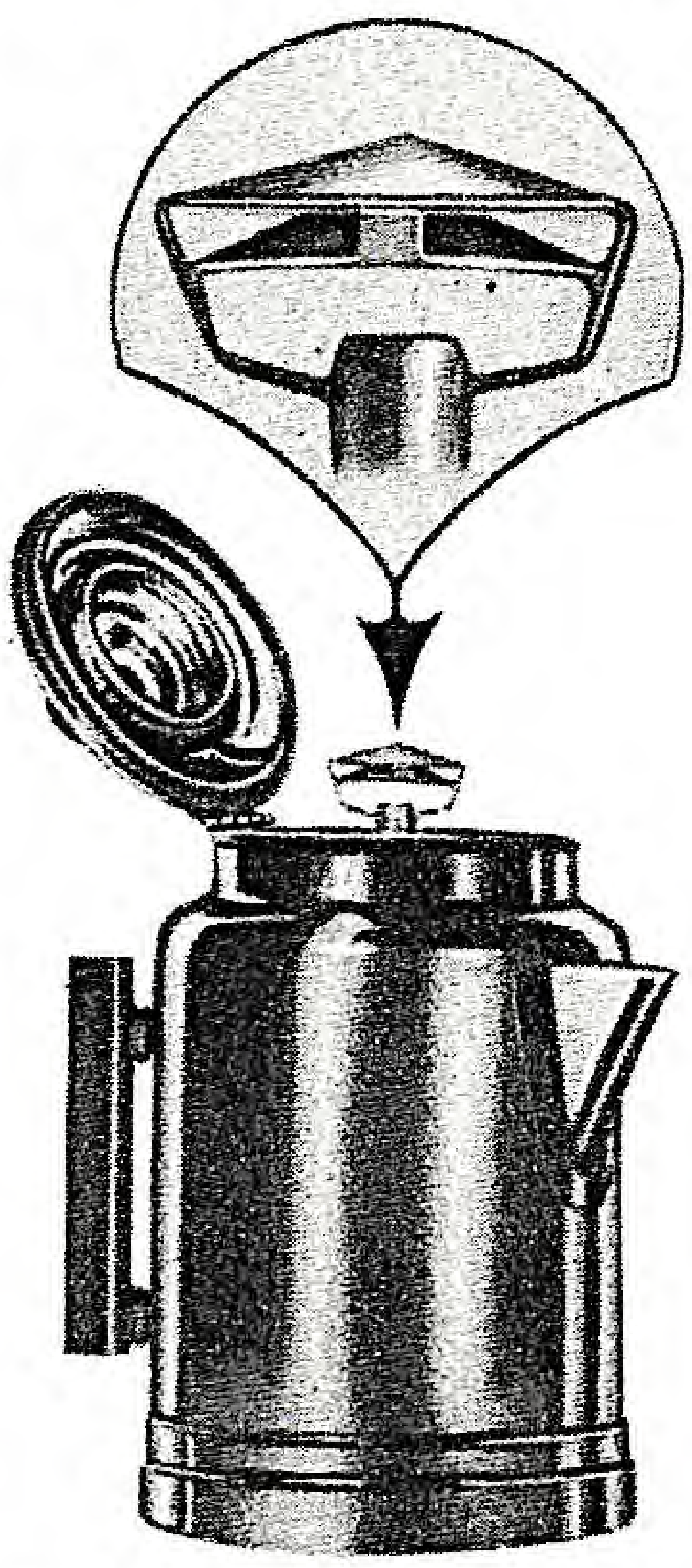
Radio Resistors Are Rock-Hard



Lead wires are firmly attached to ends of improved type radio resistor having constant characteristics, high current carrying capacity. Color code indicates size.

TWO kinds of material, one of high resistance, the other conductive are mixed together in various proportions to form different sizes in a new line of molded resistors for radio work.

Deflector Protects Percolator Top

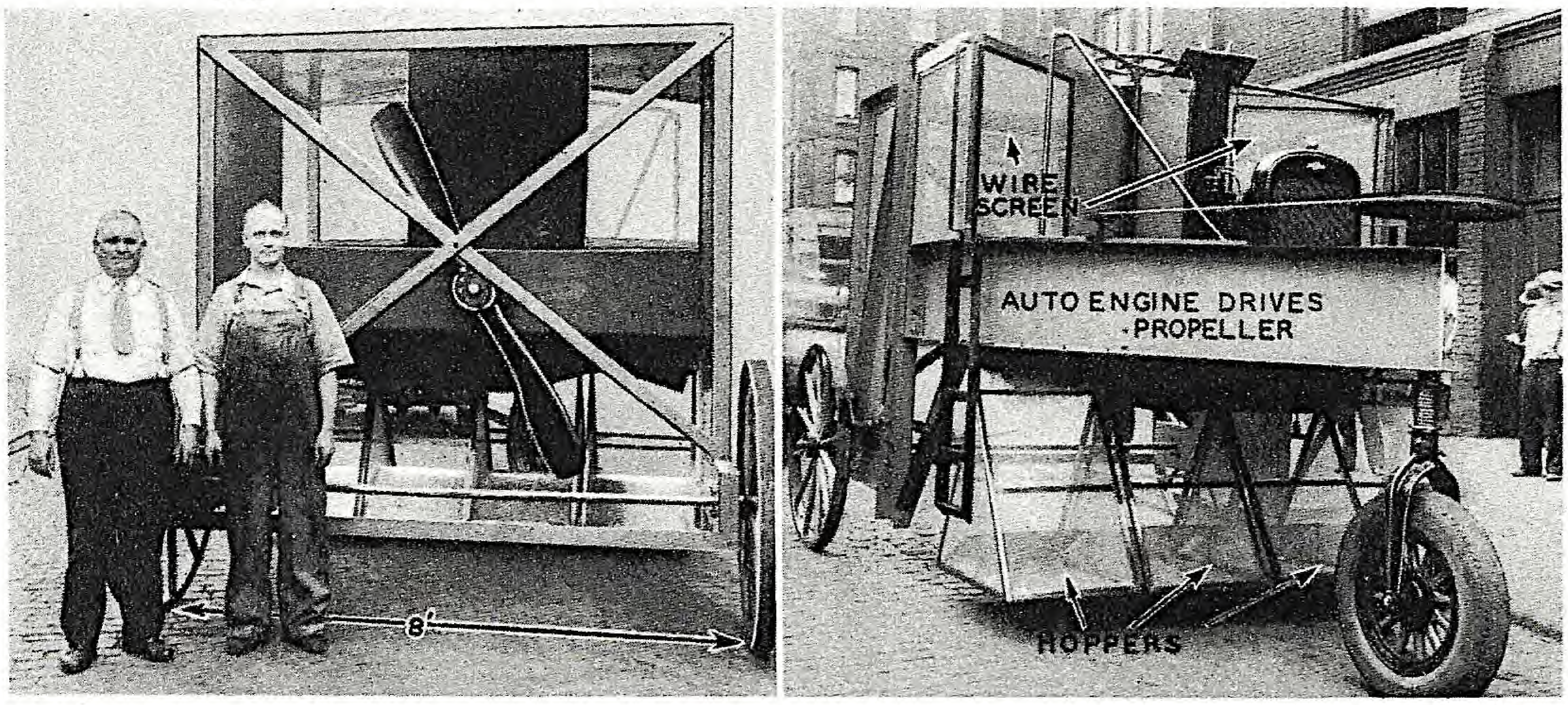


Simple deflector slips over percolator pipe, prevents cracking of the glass top.

AMONG the latest of household developments is a tiny deflector which slips over the top of the central tube in a coffee percolator and prevents the boiling-hot liquid from cracking the cold glass top the first time the water is dashed against the glass by steam.

Less time is required with this device to make coffee, since the hot water is more evenly distributed over the ground coffee. An adjustable sleeve permits use of the appliance on all sizes of percolators.

Grasshopper Death Machine Fights Farmers' Insect Menace



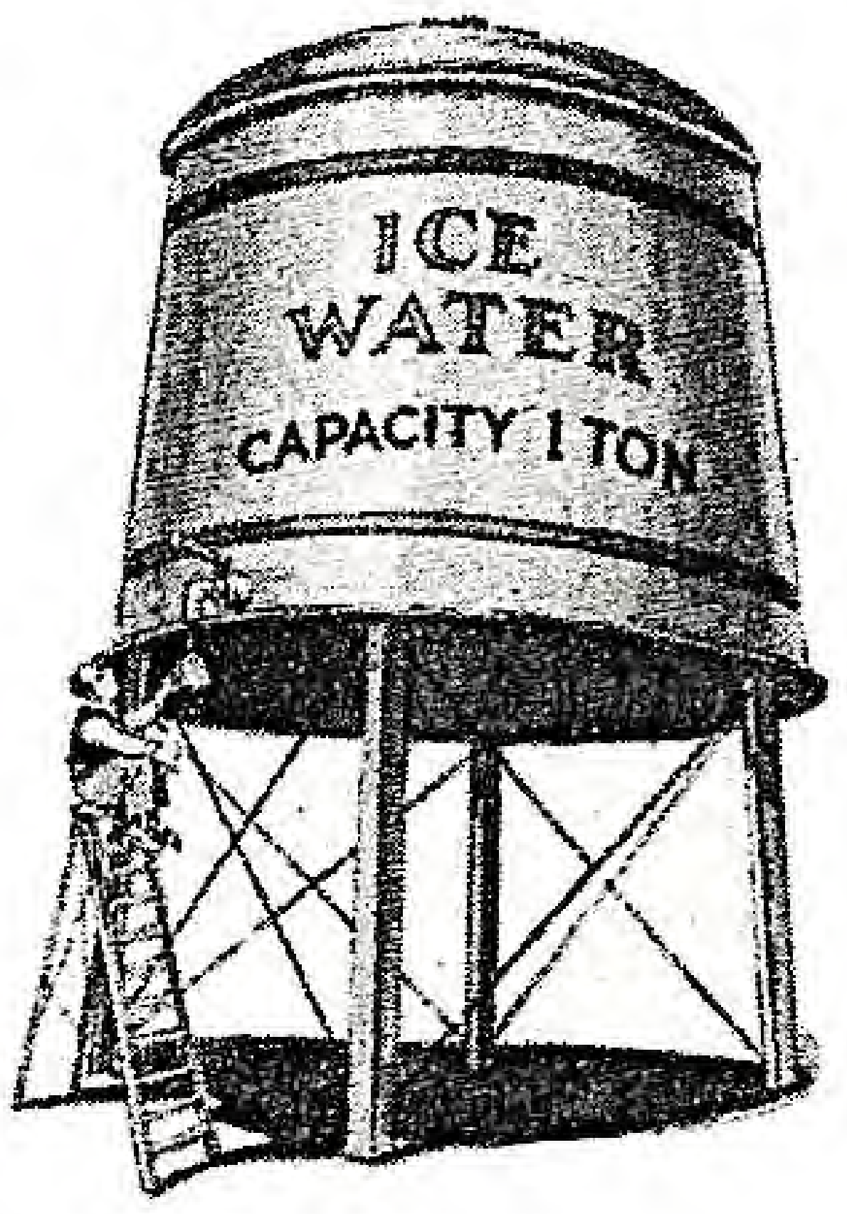
This 'hopper-killing device is the invention of Joseph Dillman, North Dakota farmer, and Henry Olson, of Minneapolis, who are shown at the left above. Note the four suspended wire cages, at right, into which the dead insects are blown and collected.

FOR seven years Joseph Dillman, wheat farmer of Strasberg, N. D., stood by helplessly and watched huge swarms of grasshoppers descend upon his grain fields and lay waste to his crops. Then this practical-minded person set about to devise a death machine which would put an end to the destructive insect plagues.

He built a three-wheeled device, screened on all sides except the front. Inside of the box he mounted a propeller, which not only drives the machine forward but sucks the grasshoppers into the trap. The force of the air is claimed to be so great that it will pulverize the bugs, sifting them through the ¼-inch mesh.

PARAGRAPH ODDITIES
OF SCIENCE

THE roar of a lion and that of an ostrich are so much alike that a person cannot differentiate between them at a distance. The ostrich, however, roars by day and the lion by night.—Kenneth Potter, Wauconda, Ill.



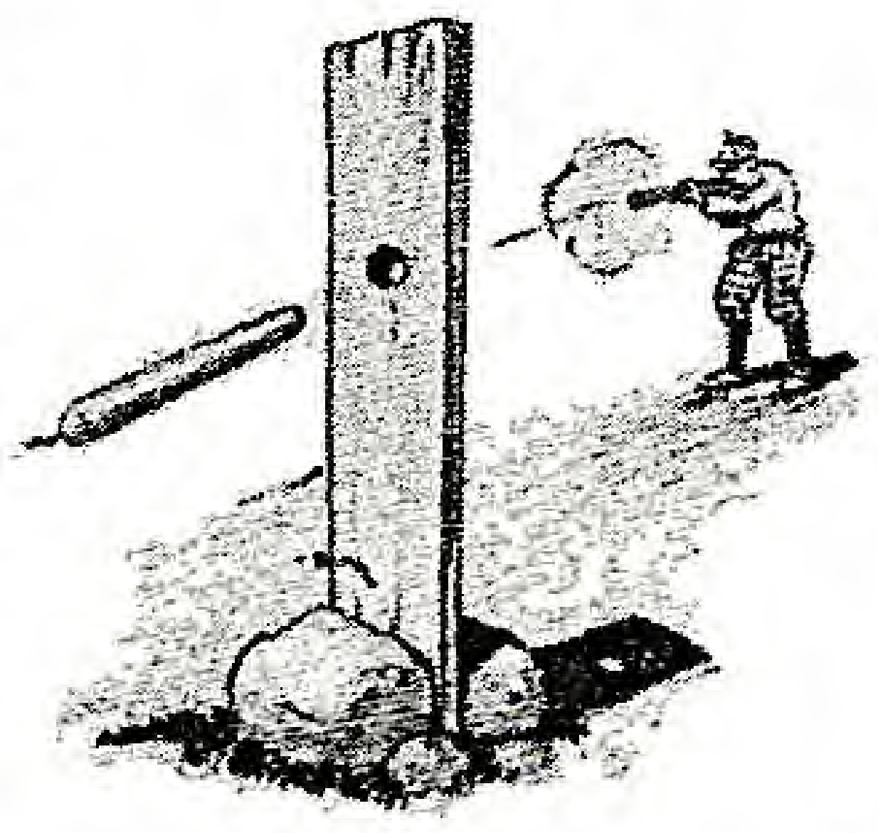
During the period of a single year, the average adult will consume a ton of water.—Mrs. P. M. Wolgemuth, Hershey, Pa.

When grosbeaks and scarlet tanagers are confined in captivity and fed on canary seed, they lose their brilliant scarlet color and turn a pale yellow.—J. S. Kuslich, St. Paul, Minn.

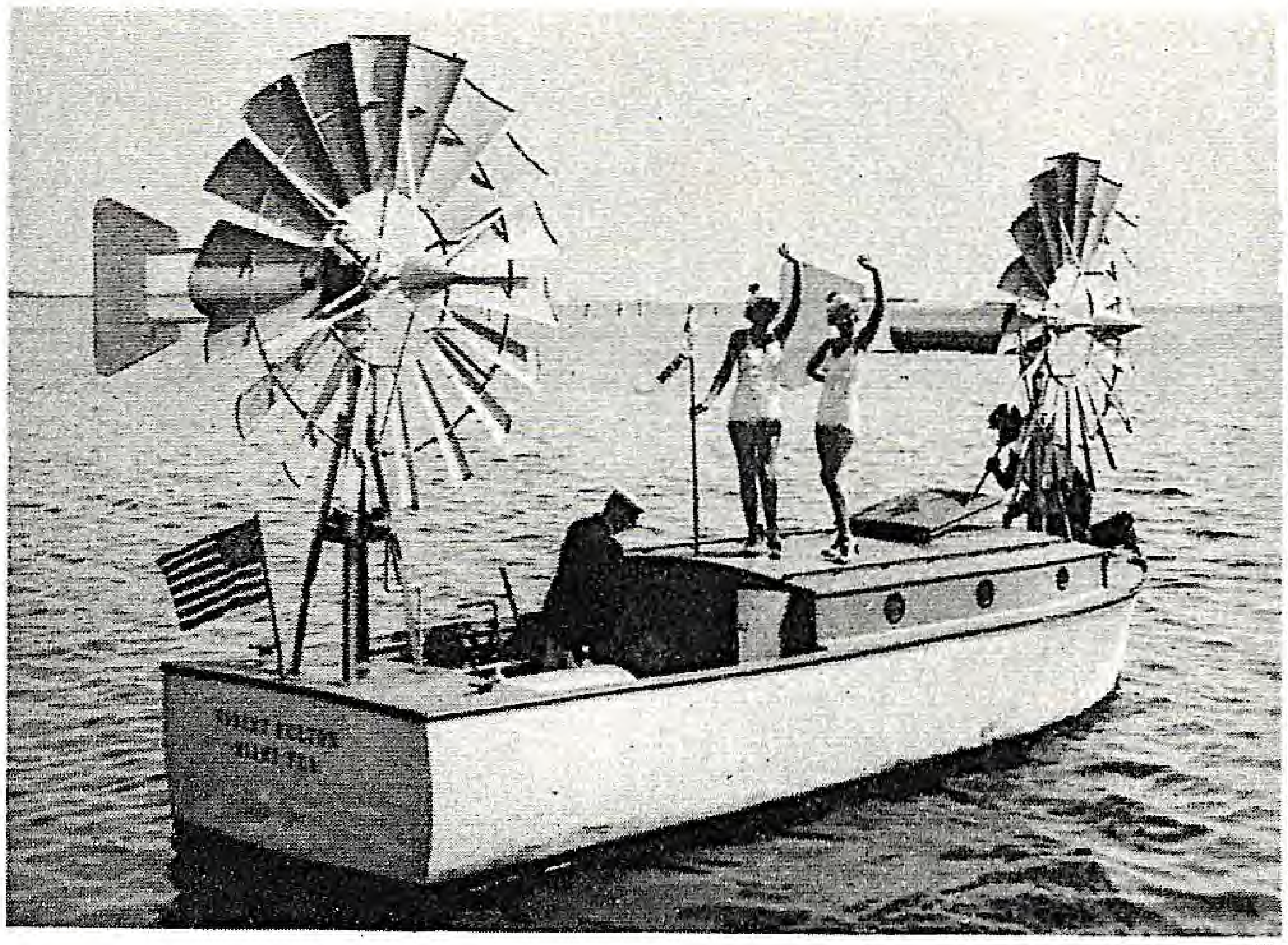
A bee's wings do not beat up and down, but rather to and fro. For the backward stroke, his wings are turned upside down. The bee gets his "lift" by stroking the air with wings held at an angle.—H. L. Bloxom, Fort Dodge, Iowa.

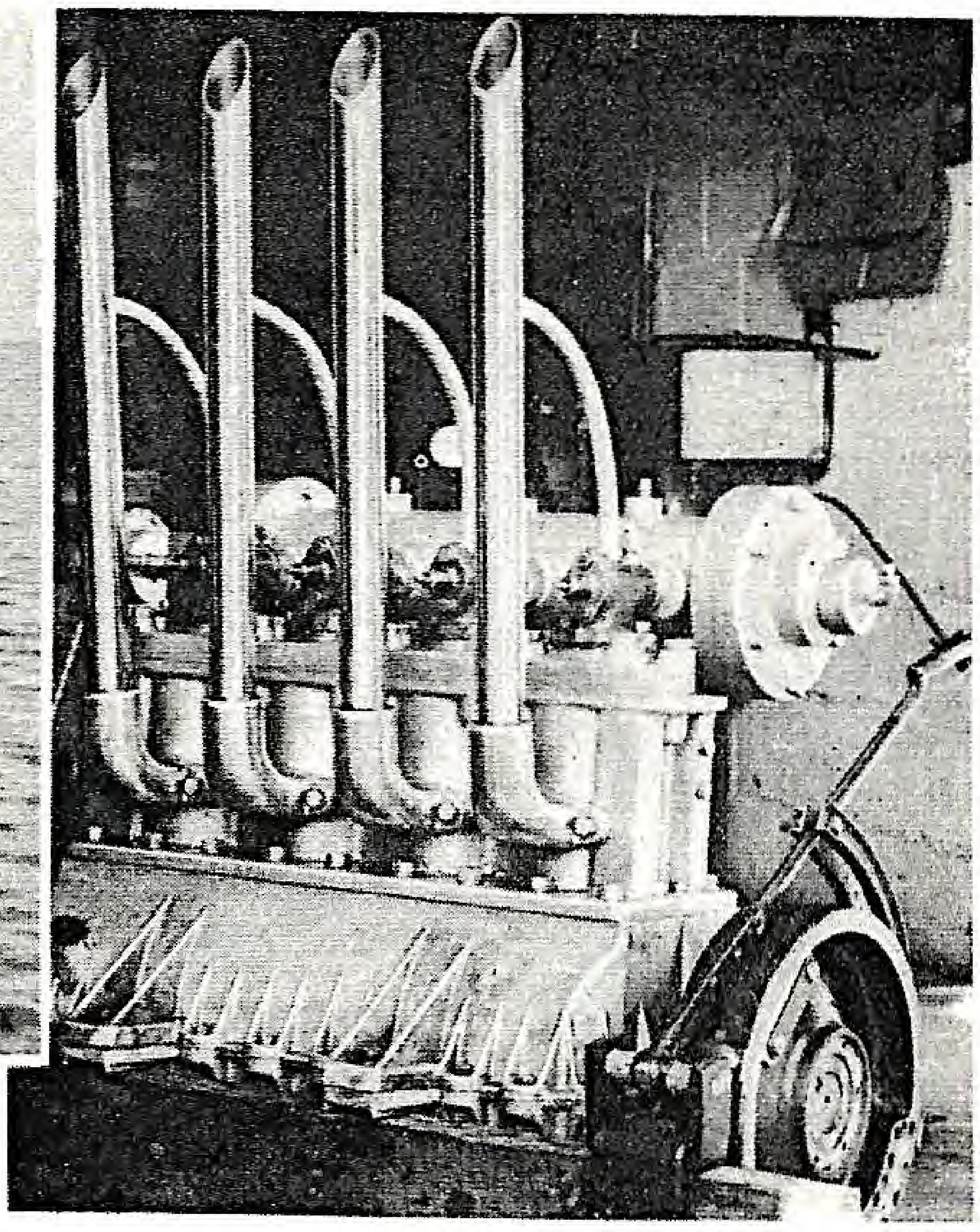
There is sufficient phosphorus in three old-style matches to kill a man, yet the human body contains enough free phosphorus to make 800,000 similar matches.—Donald Richardson, Ft. Plain, N. Y.

A wax candle, fired from a shotgun at two feet, will not damage a one-half inch board. At 25 feet, the candle penetrates it.—Gerald Benson, Twin Valley, Minn.



Compressed Air Boat Invented By Kin of Robert Fulton



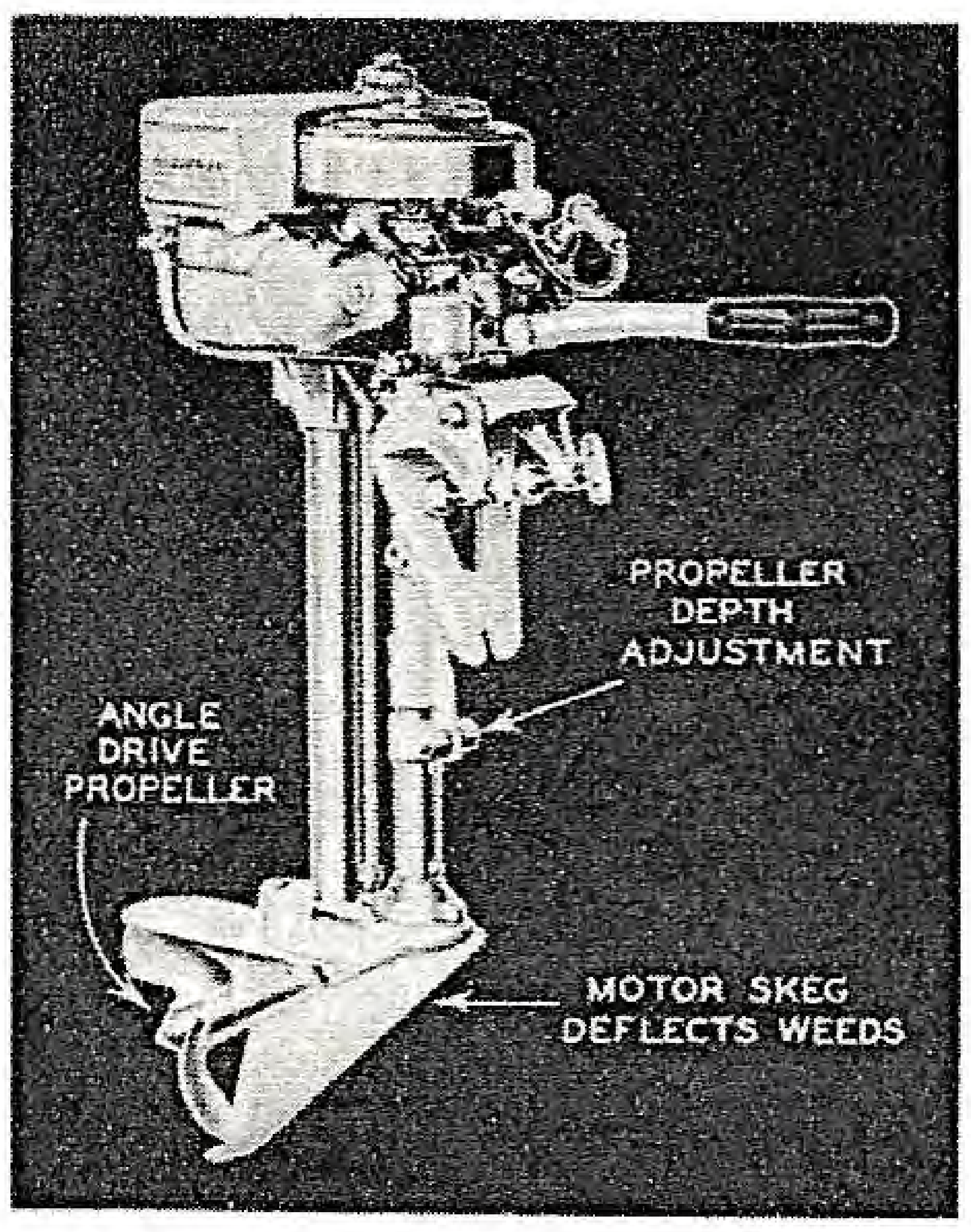


Left—This novel boat is operated entirely by air power. Right—Specially constructed motor has valve control.

AN UNIQUE 26-foot sea-going craft, propelled by compressed air, has been invented by Palmer H. Crary of Coconut Grove, Florida, the only living descendant of Robert Fulton.

Two eight-foot windmills, mounted on the deck, operate two air pumps which force air into large compression tanks inside the boat. Pipes with control valves lead from these tanks to a specially-designed air motor which operates the drive shaft and propeller. At a maximum pressure of 150 pounds, the boat is propelled at top speed, while a slow speed can be maintained with only 20 pounds pressure. The compressed air tanks make the boat non-sinkable.

New Outboard Motor Is Weedless



Weighing 45 pounds, this outboard can navigate weed-infested lakes.

A WEEDLESS outboard motor, which is capable of plowing through the thickest of underwater jungles without hooking a single weed, is now on the market. An angle-drive propeller and a long skeg are said to do the trick while navigating.

Auto Tube Makes Blowouts Safe

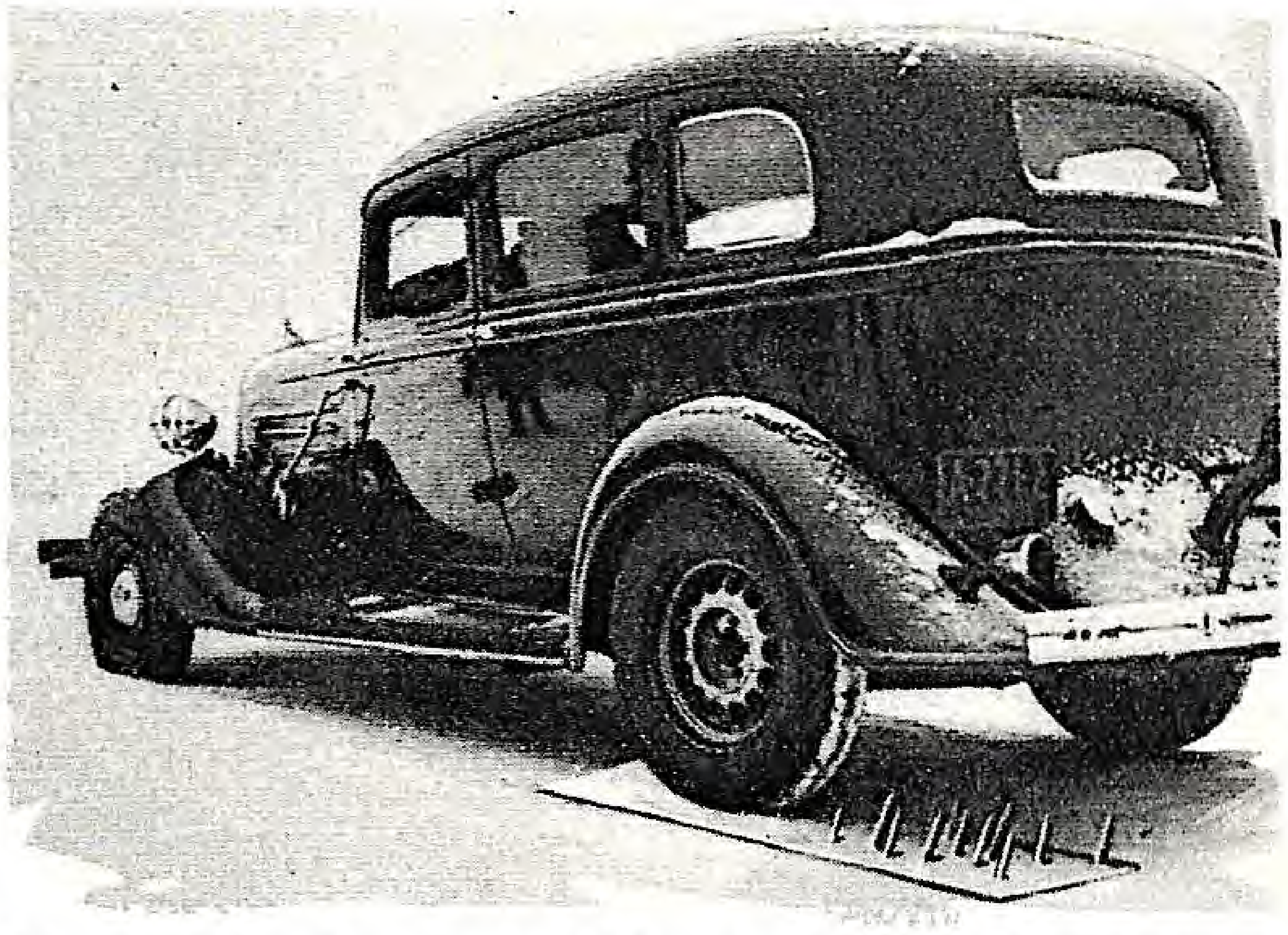
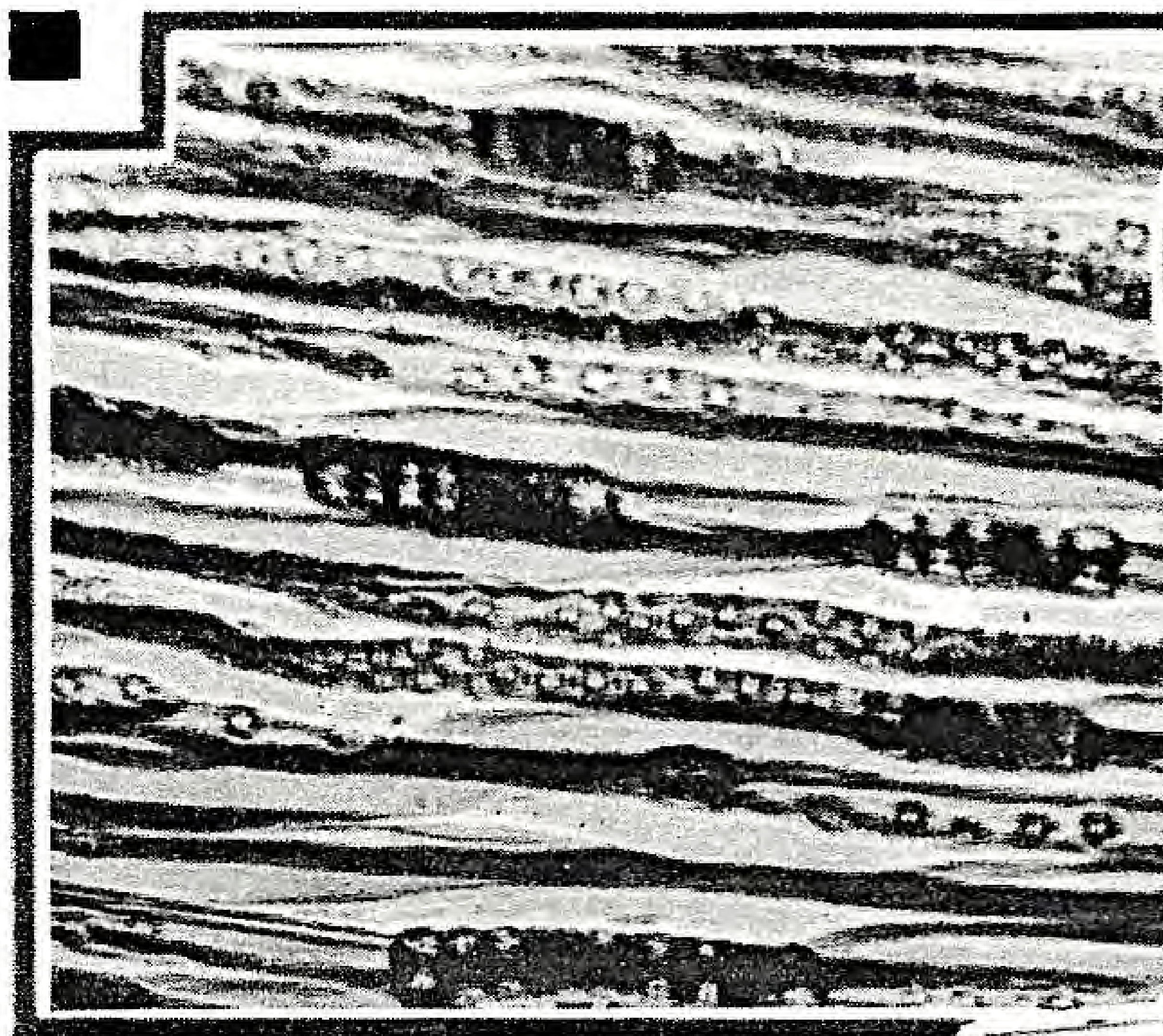


Photo taken after car was driven at 30 m. p. h. speed over spikes. Ordinary front tire blew out, but special tube in rear did not. Floating inner chamber is immune to punctures.

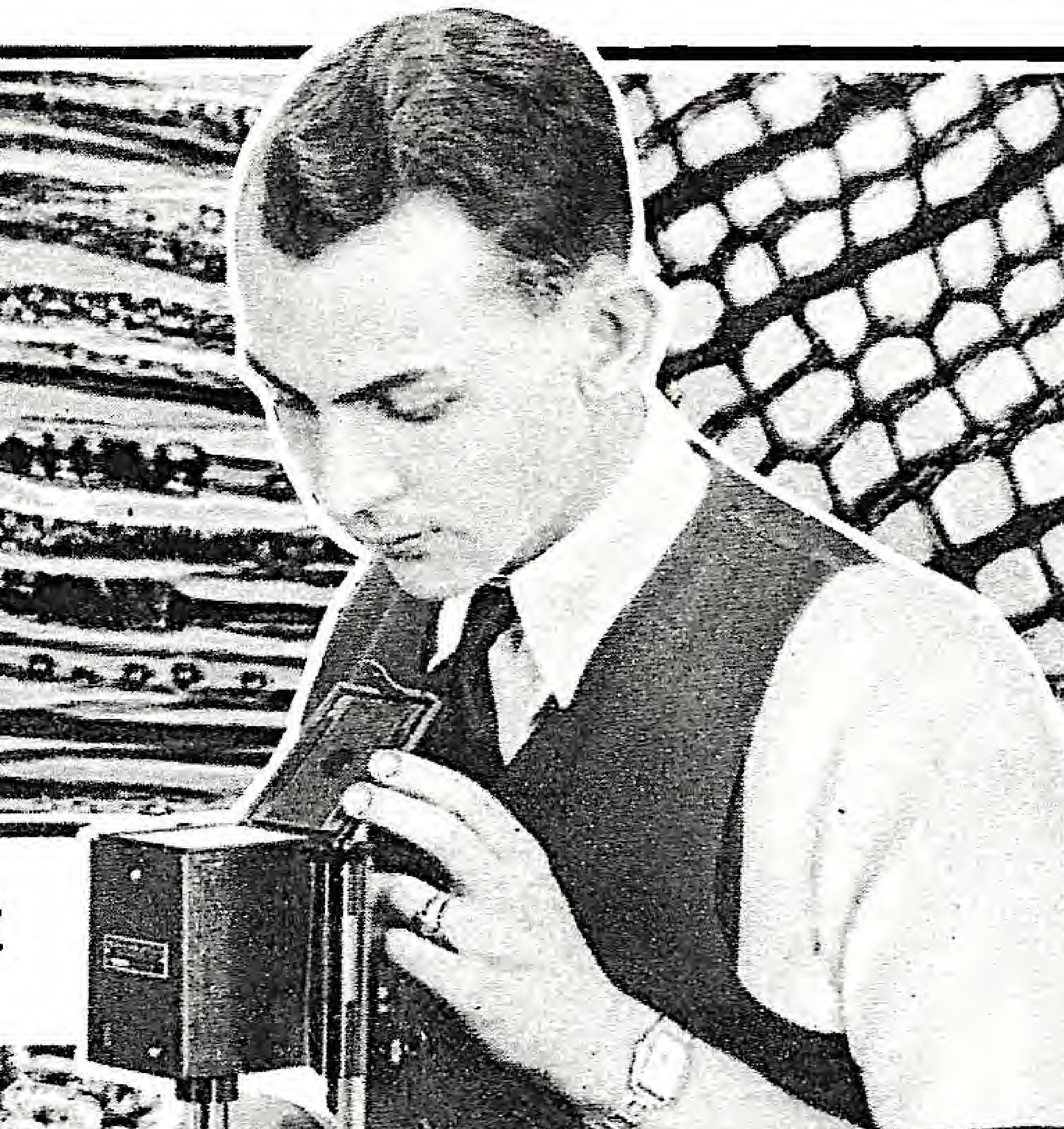
BLOWOUT protection for autoists is assured with a new type safety tube which consists of an inner and outer air chamber, connected by a tiny vent. When the tire is punctured, air escapes quickly from the outer chamber. The wheel is supported by the slow-leaking inner chamber which eliminates the danger of a swerving car and allows the driver to bring his auto to a dead stop before the tire flattens out completely.

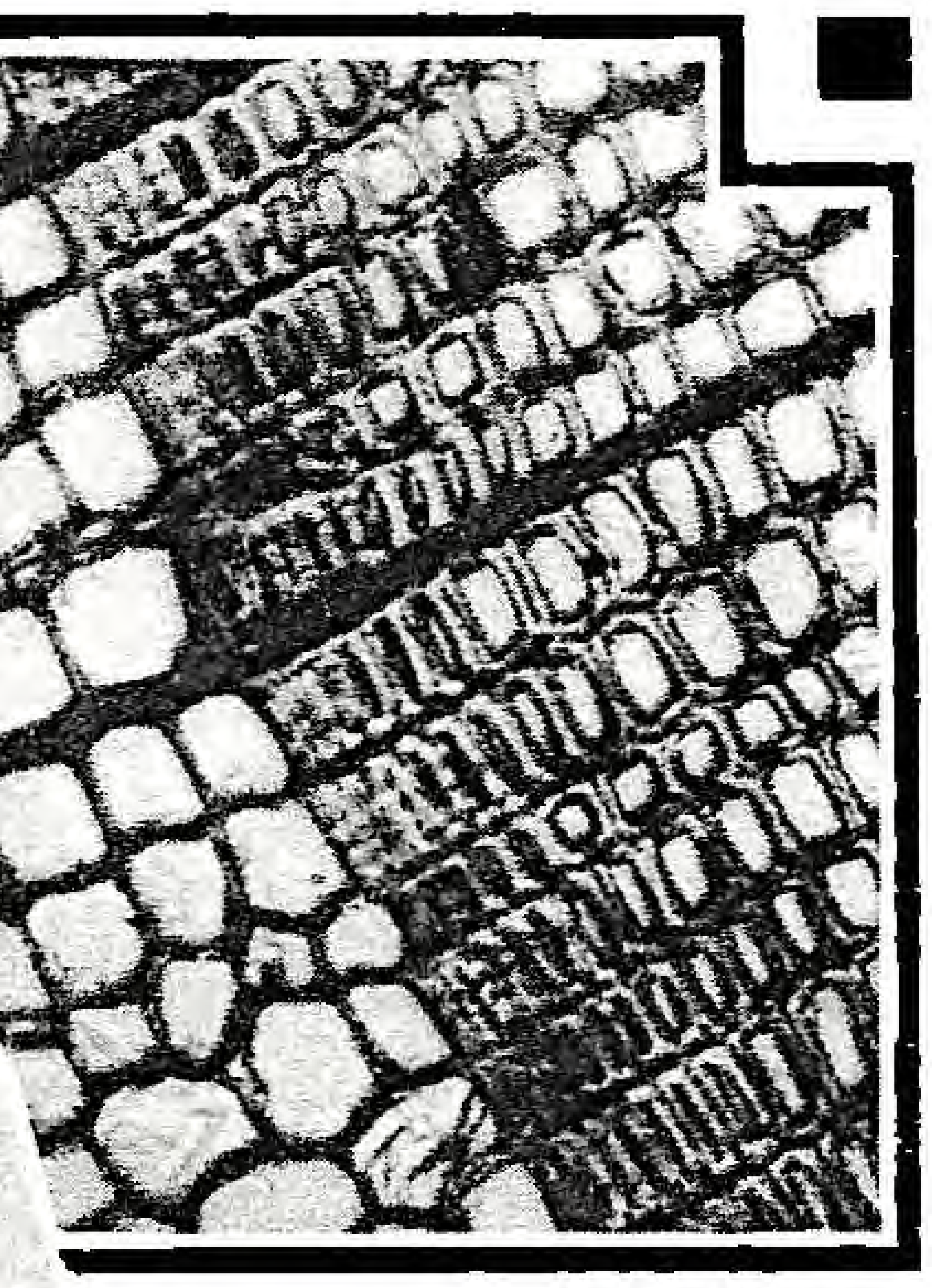
Engineers have demonstrated the usefulness of the new tire by slashing it with knives and driving it at high speed over a spike-impregnated pavement. Hundreds of tubes have been blown out in public tests by a knife-tripping device attached to the bumpers.

Your Microscope Will Identify TREES

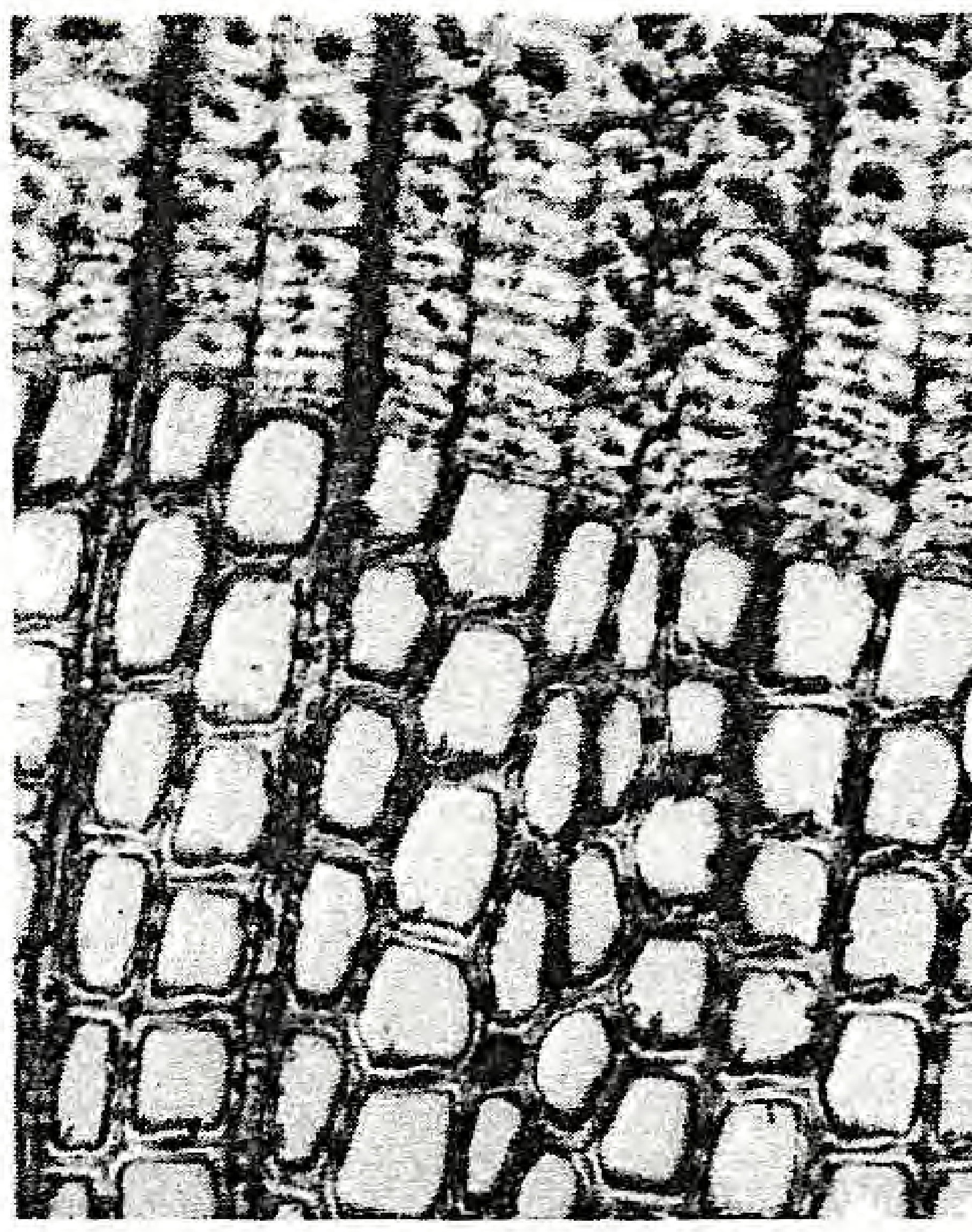


Microscopic photo of Douglas Fir, taken parallel to grain of the wood.

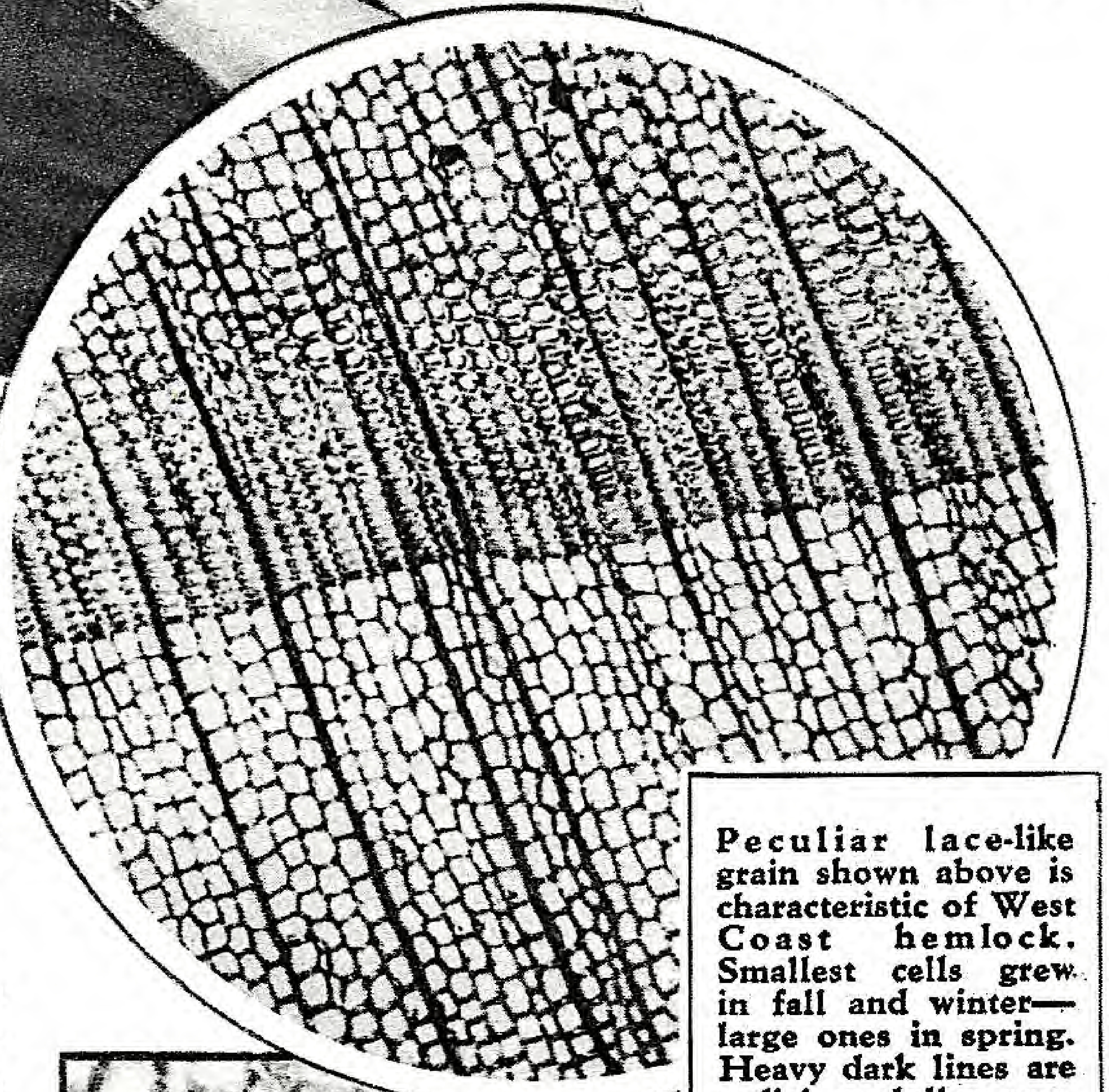




A wood expert would recognize this grain pattern immediately as that of the sturdy Western Red Cedar. Dark lines are the medullar rays.



This microscopic picture of the Douglas Fir shows cross-section of grain. Largest cells are spring growth. Wood grain pictures like those on this page are from negatives made with inexpensive apparatus like that shown in above photo.

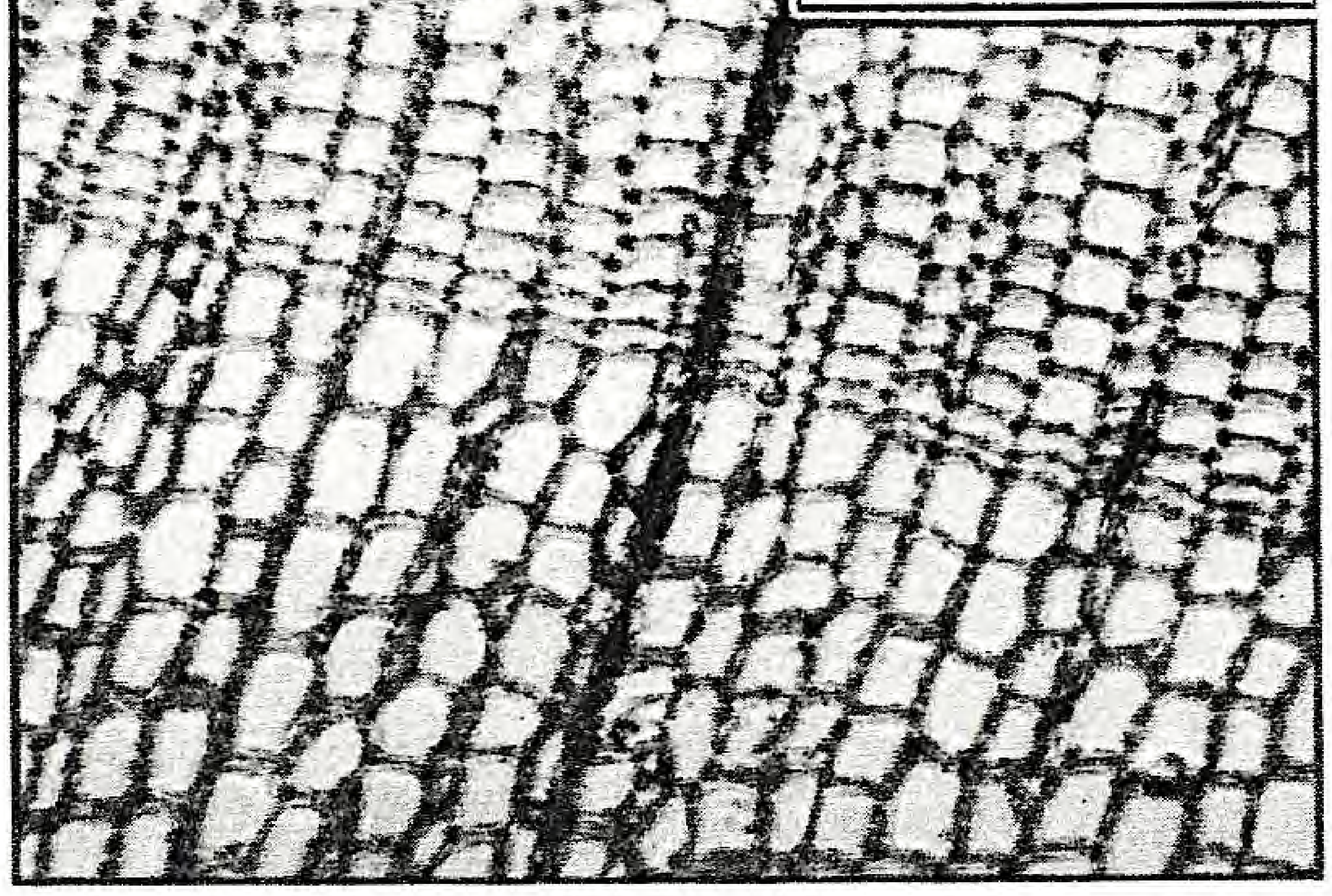


Peculiar lace-like grain shown above is characteristic of West Coast hemlock. Smallest cells grew in fall and winter—large ones in spring. Heavy dark lines are radial medullar rays.

THE outstanding work of Arthur Koehler, one of the nation's leading forestry experts, in tracing wood used in the Lindbergh kidnap case ladder aroused the interest of all who followed the trial of Bruno Hauptmann with its many scientific angles. Few people know, however, that very similar work in the identification of different woods can be done by anyone possessing one of the better low-priced microscopes.

Each forest giant, each shrub, each tiny plant is endowed by nature with its own trademark—a grain pattern which in reality corresponds to the fingerprint patterns of human beings. Under low-power magnification in a microscope the individual characteristics of these delicate cellular patterns are readily studied, and specimens identified by referring to photo-micrographs made from cross-sec-

[*Continued on page* 132]



Here is microscopic photograph of grain of Ponderosa Pine, similar to the wood used in Lindbergh kidnap case ladder.

Training Tomorrow's

William Harridge, author of this article, is shown above opening American League season. Right—Bill Terry works out on a lawn roller during training with the New York Giants.

Top—Babe Ruth and his trainer, Artie McGovern, condition on the rowing machine. Lower—Lou Gehrig, Yankee star, chops wood to build up muscle.

by

WILLIAM HARRIDGE

President of the American League of Baseball

ONE of the surest harbingers of spring is the appearance in the newspapers of the box scores of the baseball spring training exhibition games. But the story behind these apparently meaningless non-championship encounters is one that embodies high expenditures, the heart-breaking tragedy of the rookies who can't make good and the painful tedious grind of muscle hardening.

The major leagues spend more than a half million dollars each spring to prepare their highly-geared baseball machines for the six-month campaign which follows. This tremendous expenditure must be anticipated before there is any assurance that a single nickel of it will be returned to the harried baseball proprietor.

To the casual observer, the life of a baseball player may appear to be one of ease with a pretentious salary to safeguard the future and not more than three hours of work (or play) on days when it doesn't rain. The magnate's job may seem to be merely a matter of counting the many thousands of paying customers who pass through the turnstiles.

These are mistaken impressions, for not more than four major league clubs finished the 1934 season without a huge loss. The

Baseball Stars . . .

Above—High-low, a training game which sharpens the eye. These Giants bat the ball in turn and must keep it in the air

Chicago Cubs went $100,000 into the red. The late Phil Ball, owner of the St. Louis Browns, lost more than a million dollars in five years. Charles A. Comiskey, who once knew the winner's glory, had spent twice that sum in an effort to rebuild his White Sox from the wreck left in the wake of the scandal which ruined his ball club in 1920.

But this is the story of the magnate. What of the player? Major league clubs will take an average of thirty to forty players to the training camps each spring. Many hopeful "rookies" are doomed to disappointment at the outset, for on May 16 the number of players in active service in each club must be cut to twenty-three.

No opportunity must be overlooked to discover new talent among the young rookies who clutter up the camps. Because each must have his chance to prove major league worth, these youths are given every attention in the clubhouse. They come and go and, in most cases, are never heard of again, but this must not deter from the vigilance necessary to bring out the stars of tomorrow.

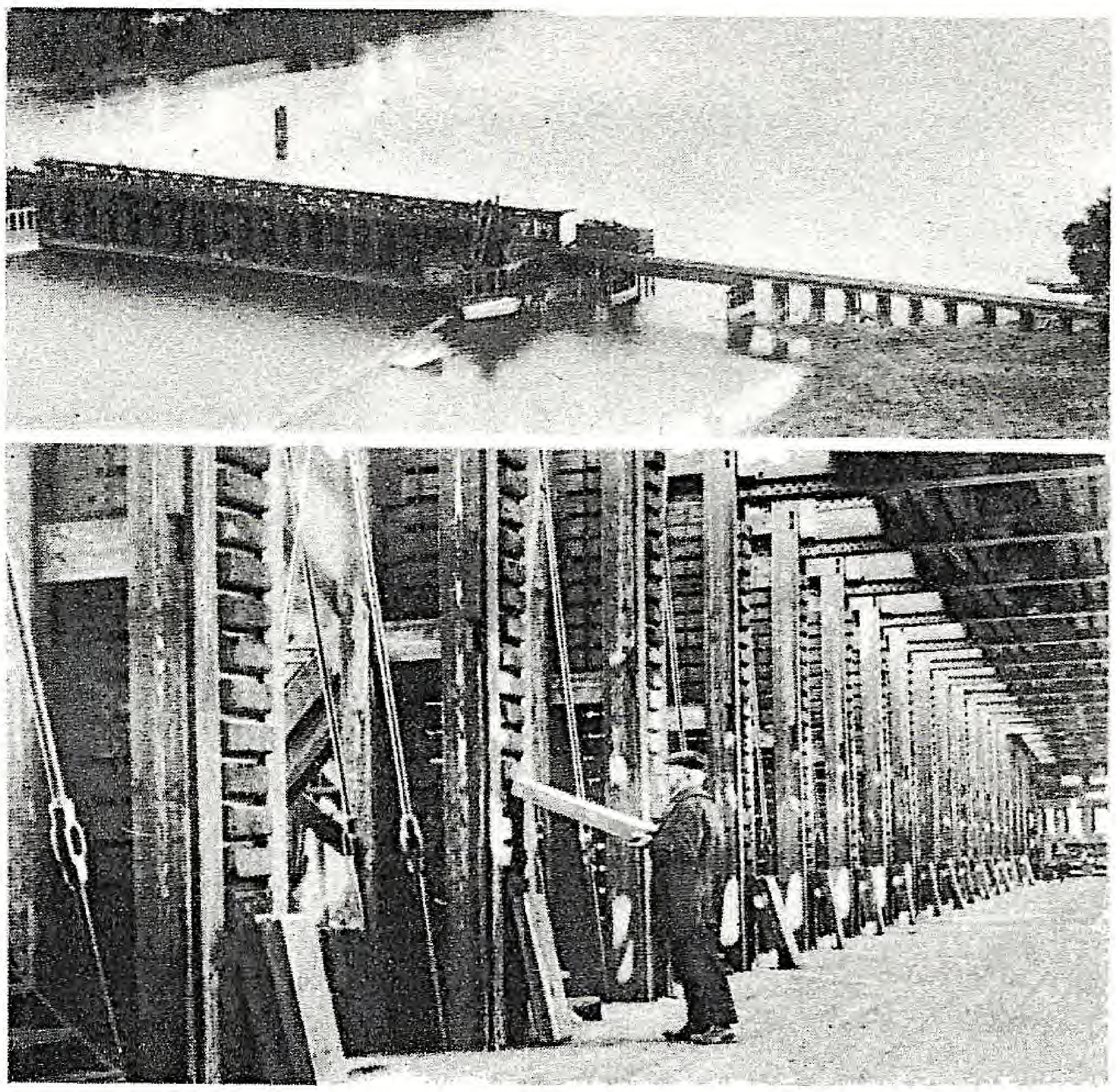
Every camp has a definite daily routine which varies according to the discretion of the manager. The program runs something like this: 8:30 a. m., call to awaken; 8:35 a. m., second call; 9:00 a. m., breakfast; 10:00 a. m., report to training field; 12:30 p. m., light lunch in clubhouse; 1:00 p. m., resume training; 3:00 p. m., cease training; 7:00 p. m., dinner; 12 midnight, retire.

The hotel telephone operator has a standing order to call every player at 8:30 a. m. A second call is put in five minutes later to arouse late sleepers. The breakfast meal may be a little heavier than the average person's breakfast to provide adequate sustenance for the day's training requirements. The diet must of course be varied to include fruit, proteins and a moderate quantity of alkalines. An inspection of the dining room check will reveal any violations.

Charlie Grimm builds up the Chicago Cubs at the Catalina Island camp with this exercise that resembles rowing.

[Continued on page 133]

Bridge On Pontoons Adjusts Self To Water Level Changes



Top photo reveals an oddity in bridges spanning the Mississippi. This unusual bridge can be swung around to allow passage of river boats or closed to permit trains to cross. Lower—Bridge tender removes a wooden plank from one of a long row of rail supports to compensate for rising river.

THE only railroad pontoon bridge in the world, located across a waterway navigated by large boats, is an odd-looking structure which spans the Mississippi river at Marquette, Iowa.

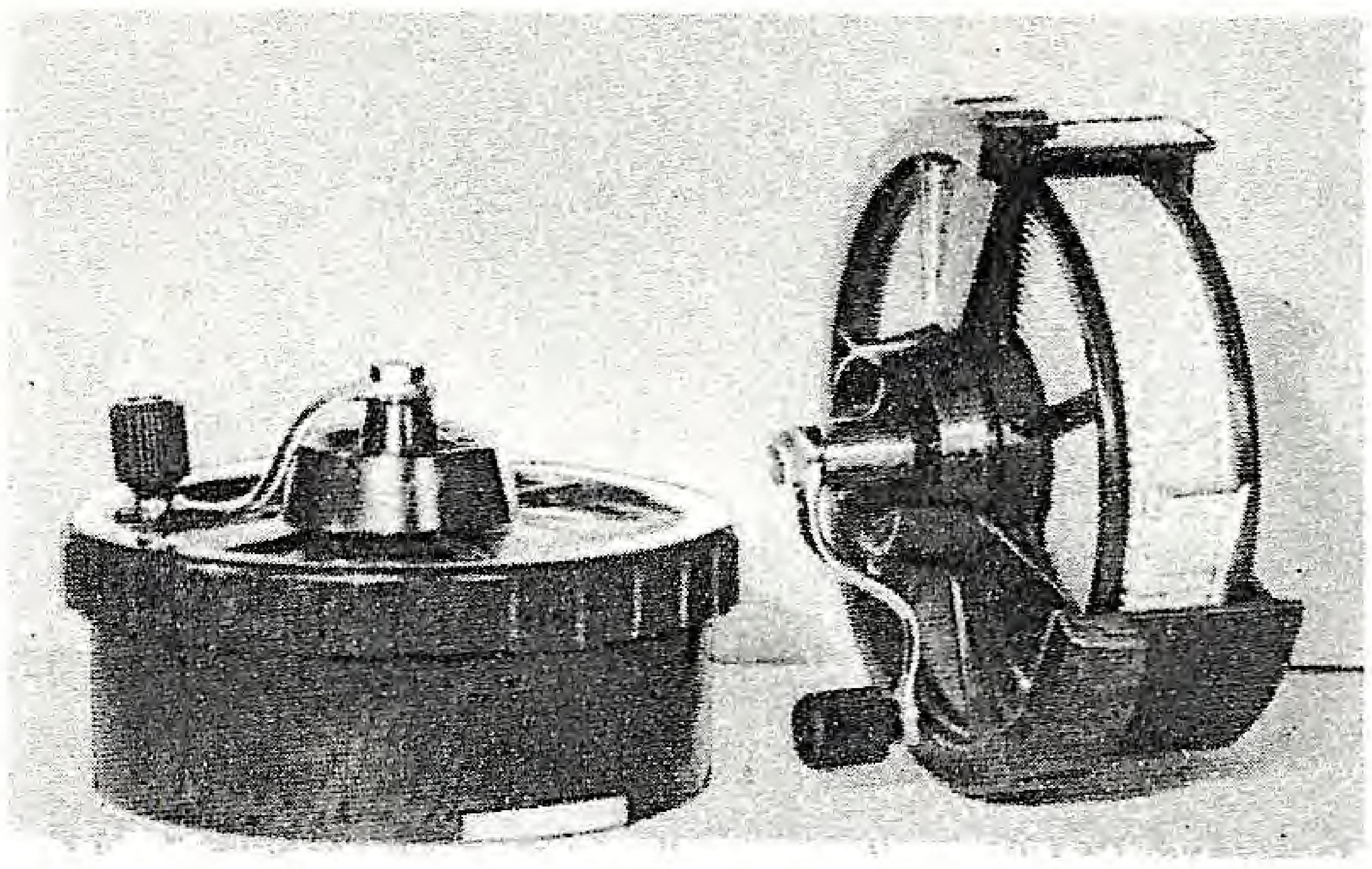
The huge pontoon floats in the middle of a pile bridge which extends out into the channel from either shore. Hinged at one end, it can be swung out by steam power to permit boats to pass and then returned to its normal position for train-crossing.

When the river rises and falls, the pontoon operates to keep the railroad at the same height. In the early spring, bridge tenders simply remove blocks by hand from beneath the rail supports to correspond to the number of inches of rise. As the river falls, the wooden blocks are again reinserted to compensate for the difference in altitude.

Two floors are built in the pontoon, one floor in the hull, and the other overhead to support the regular metal rails. The upper floor is held in position on either side with nineteen columns of nine-inch movable wooden blocks. Only the lower floor mounts and drops with the changing water level, while the upper floor remains at constant height.

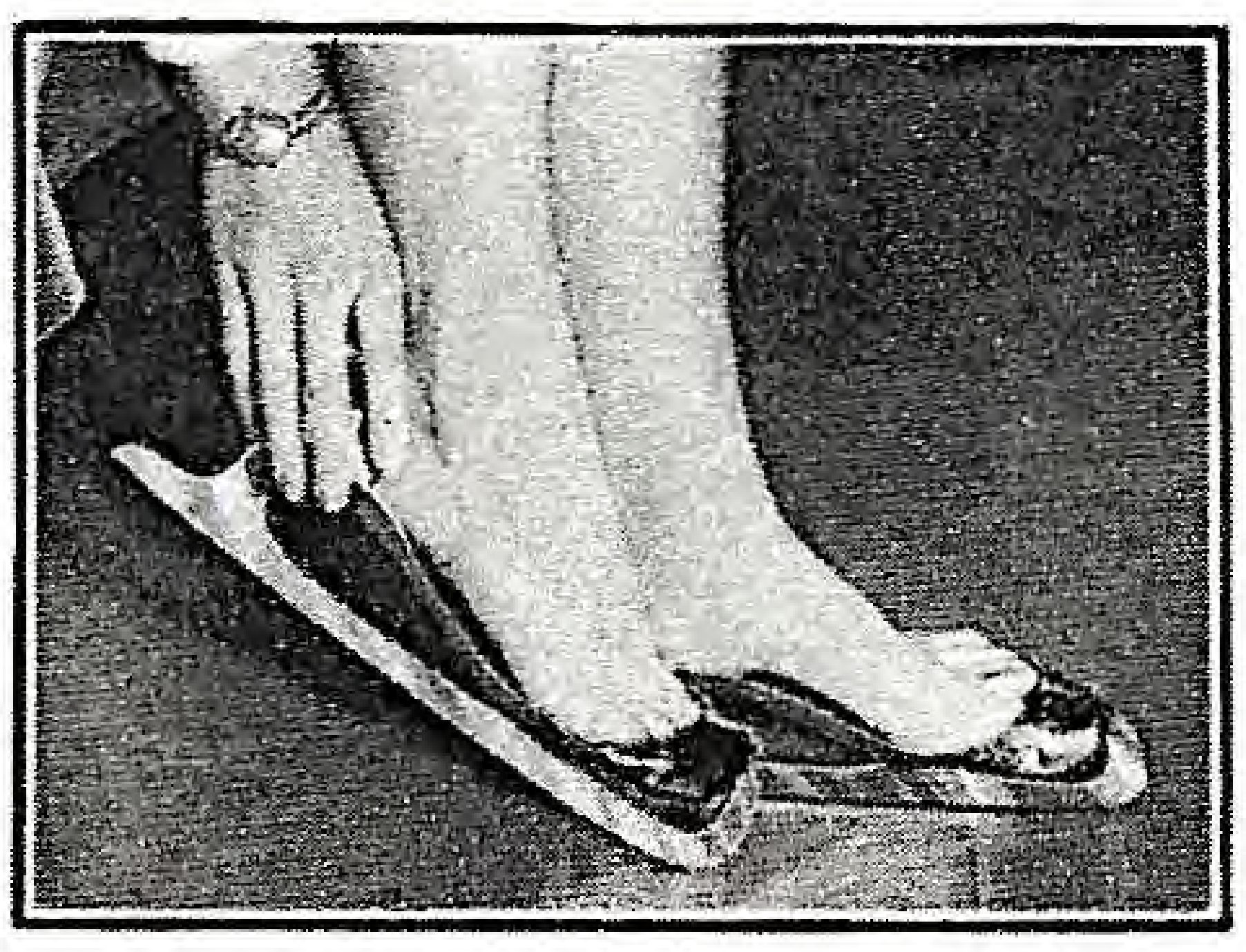
Tank Develops Films In Mid-Air

AERIAL photographers may now process their exposed films while they are still in the air enroute to their bases by employing a recently developed bakelite tank. Light is excluded from the roto-tanks by a by-pass which also drains the container of its solution. Maximum agitation insures quick uniform development of the highlights and shadows. Only eighteen fluid ounces of chemicals are needed. The tank accommodates either professional or amateur film.



This unique developing tank can be carried aloft by aviators for processing aerial films as quickly as they are taken. Tanks hold 25 feet of 35 mm. or 50 feet of 16 mm. film.

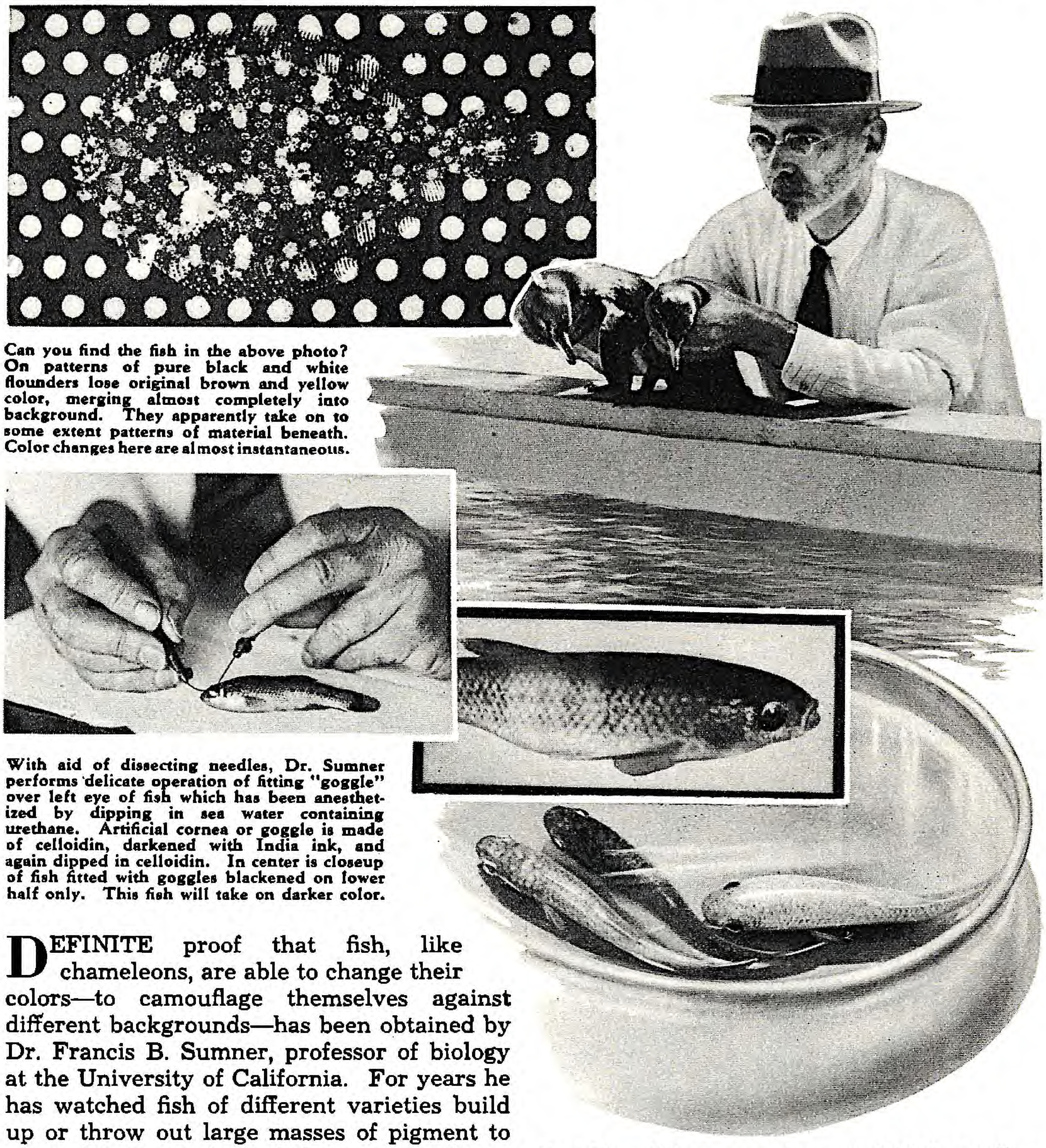
New Skate Designed To Fit Foot



At last science has come to the aid of ice skaters by creating this skate which fits the contour of the foot.

A NEW process of skate-fitting, which threatens to revolutionize the entire skating industry, is now being developed. Knowledge of surgical and orthopedic methods has been applied in a scientific effort to design a skate which would fit the foot. First, a cast of the foot is made. The metal work on the skate is fabricated according to modern metallurgical technique. The peculiar form of the in-step is claimed by the inventor to make for better retention of the skate on the foot. A jacket type shoe covers the slipper-like form.

Fish Change Color Like Chameleons



Can you find the fish in the above photo? On patterns of pure black and white flounders lose original brown and yellow color, merging almost completely into background. They apparently take on to some extent patterns of material beneath. Color changes here are almost instantaneous.

With aid of dissecting needles, Dr. Sumner performs delicate operation of fitting "goggle" over left eye of fish which has been anesthetized by dipping in sea water containing urethane. Artificial cornea or goggle is made of celloidin, darkened with India ink, and again dipped in celloidin. In center is closeup of fish fitted with goggles blackened on lower half only. This fish will take on darker color.

Top: These Galapagos penguins captured fish they could see more easily, providing that protective coloration does save lives of fish. Below: Fish on left is normal; center one, wearing goggles with lower half black, has turned dark; fish at right, with upper half of goggles black, has become pale.

DEFINITE proof that fish, like chameleons, are able to change their colors—to camouflage themselves against different backgrounds—has been obtained by Dr. Francis B. Sumner, professor of biology at the University of California. For years he has watched fish of different varieties build up or throw out large masses of pigment to meet changing colors of their surroundings.

In an interesting series of experiments conducted at the San Diego Zoo, two Galapagos penguins were turned loose in tanks containing fish of mixed color. After from two to nine minutes of under-water fish catching, the penguins were hauled out and the remaining fish counted. Three-fifths of the fish eaten in white tanks were dark in color, while three-fourths of those caught in the dark tanks were pale. In each case, fish thrown into relief against the background by virtue of their color suffered the highest mortality.

Dr. Sumner actually has fitted dark goggles over the eyes of fish, producing either partial or total blindness in effect, without hurting the fish in any way.

Fish which had been blinded early in life showed no tendency to conform to their surroundings, giving additional proof that fish change color because of what they see.

Camera Makes Six Photos On One Plate; Wins Grand Prize

Photo shows C. B. Austin with his prize-winning invention. The new camera will photograph six poses on the same plate.

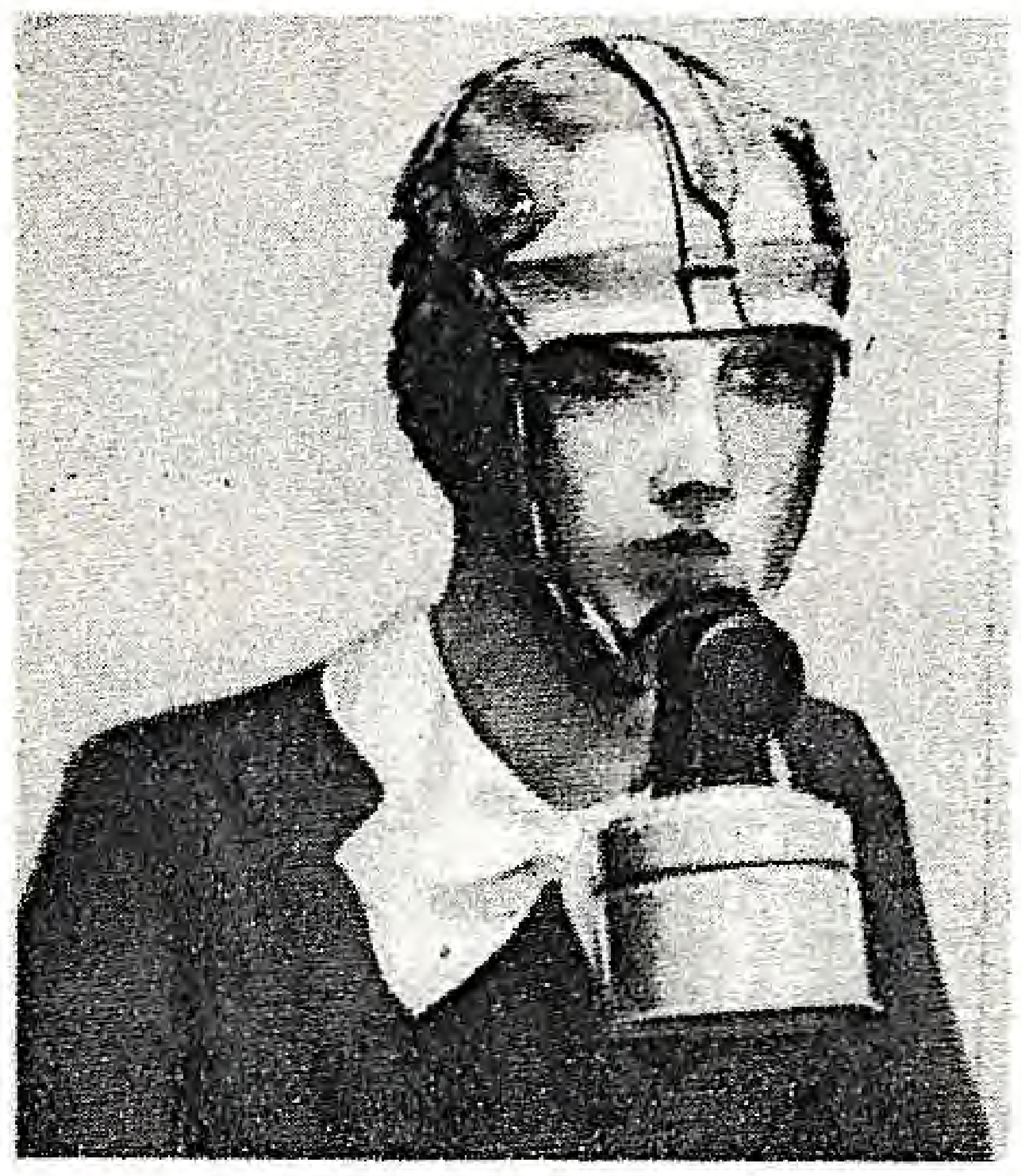
ONE of the chief attractions of the Hollywood National Inventors' Congress, picked by a committee of judges as the winner of the grand prize for the best invention, was the camera which will record six different poses on one plate.

The camera is the invention of C. B. Austin, a Los Angeles photographer, and it contains a set of matched lenses. One lens is set in the middle of the camera at constant focus; the movable lens is placed on top.

Science Perfects Multi-Dyeing

THE problem of multiple or "checkerboard dyeing," in which a number of different fabrics may be dipped in the same dyeing vat and each one emerge a different color, has at last been solved by scientific research. Experimenters found that the chemical and physical makeup of the various fibers differed. As a result, dyes were developed which would tint only wool, for instance, in combination with rayon.

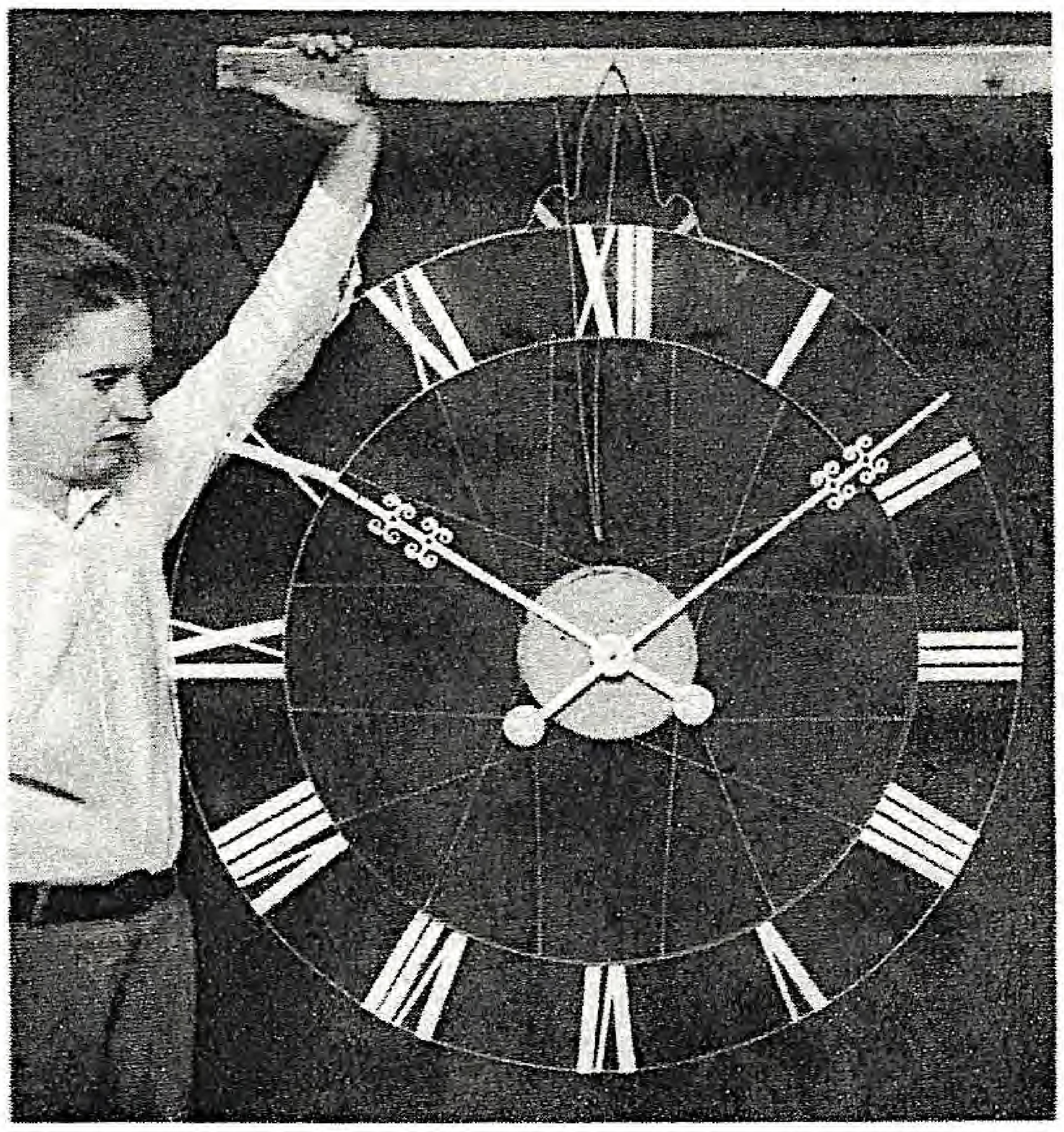
Gas Mask Designed for Typists



In case of a sudden gas attack from the air, typist dons novel gas mask.

A NEW type of gas mask, which slips over the head of an office typist in the event of an air attack, has just been developed in Rome, Italy. The face of the mask is transparent so that the typist can see what she is doing.

Whole Clock Moves As Pendulum



The clock shown above is an eight-day clock built by an Arkansas craftsman. The entire clock swings to act as pendulum.

AN UNIQUE eight-day clock which is about three feet high and swings bodily to act as its own pendulum has been built in the workshop of an Arkansas man.

An escapement wire running from the central case is attached to a wire fork suspended from the window ledge of the shop. The swinging of the clock causes the escapement to tick one notch with each swing. Each swing is about an inch and a quarter.

Mammoths Found In Bed of Ice

THE bodies of two prehistoric mammoths, perfectly preserved in ice, were discovered recently in northern Siberia. Three other partially preserved bodies, bearing nine-foot tusks and traces of curly hair, were also found.

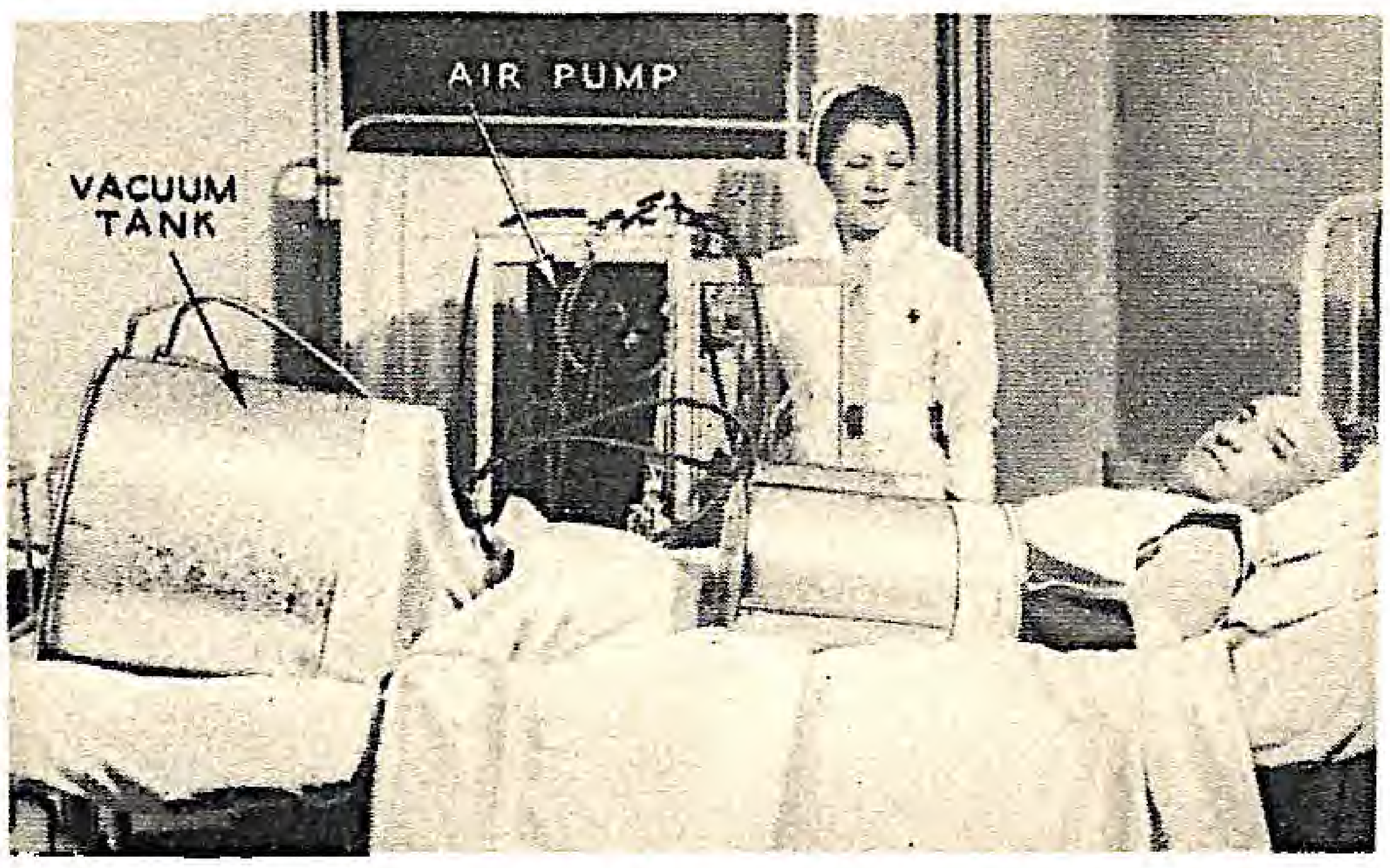
Vacuum Tanks Save Amputating Frozen Legs and Arms

DESIGNED to save limbs that would ordinarily have to be amputated, special vacuum tanks have been built to induce a flow of blood into frozen arms and legs.

The tanks, invented by Dr. R. C. Riley, pathologist of the Regina General Hospital at Regina, Sask., are constructed of galvanized steel. They are slipped over the arms and legs of the patient and tightened to form an air-tight seal through the use of long rubber sleeves held in place by adhesive tape.

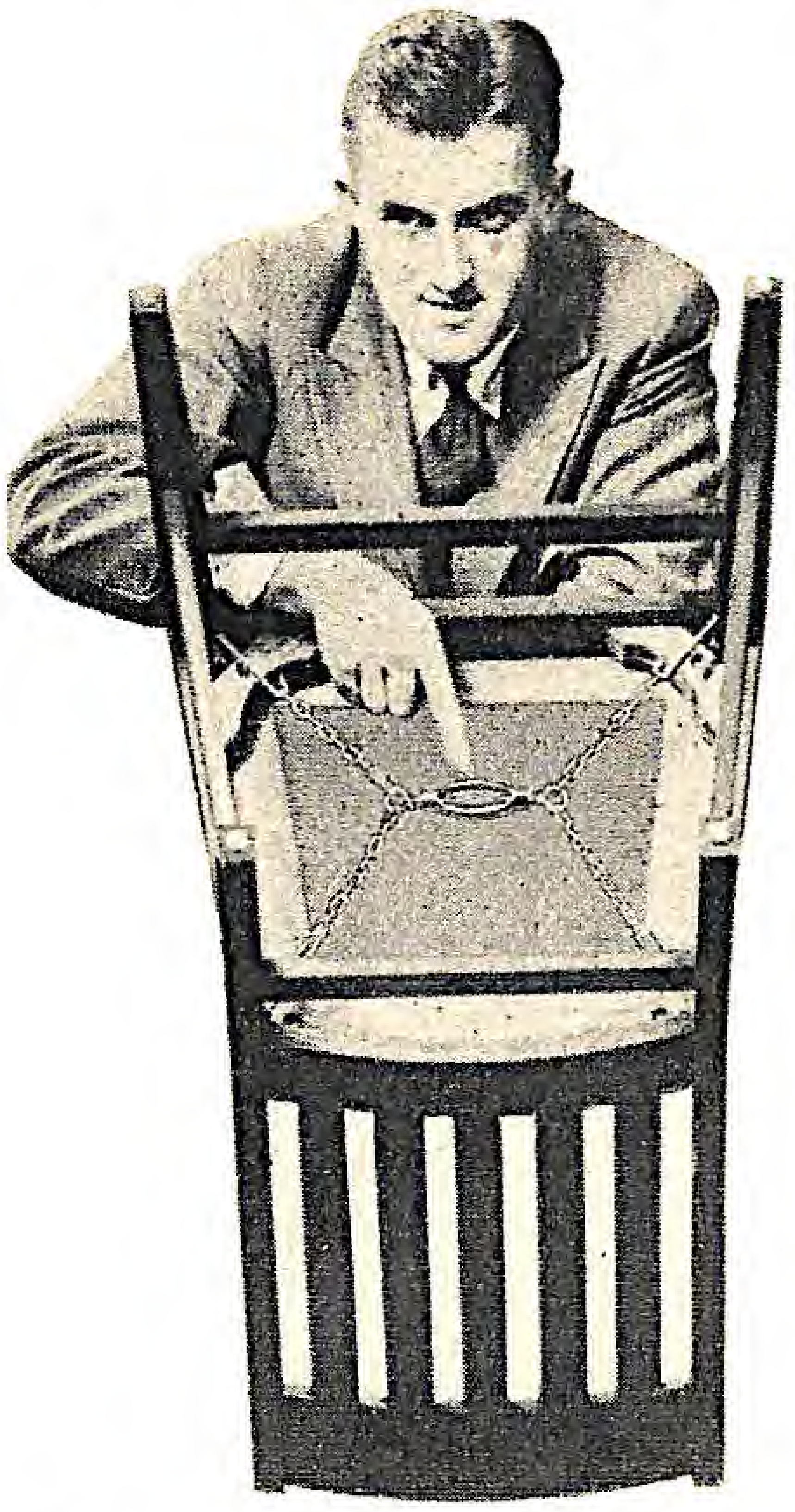
The tanks are connected by steel and rubber tubes to an air pump which alternately creates periods of vacuum and periods of normal pressure within the tank. The vacuum alleviates the pressure on the limb and allows the force of the blood stream to push blood into the frozen sections. The application of the normal pressure forces the blood back toward the heart, and it naturally carries some of the bad blood back into the body where it will do no harm.

Dr. Riley's machine is believed to be the first machine invented to do this work.



Tanks are tightly sealed to a patient's frozen limbs. Alternating periods of vacuum and pressure induce blood circulation.

New Stay Strengthens Old Chairs

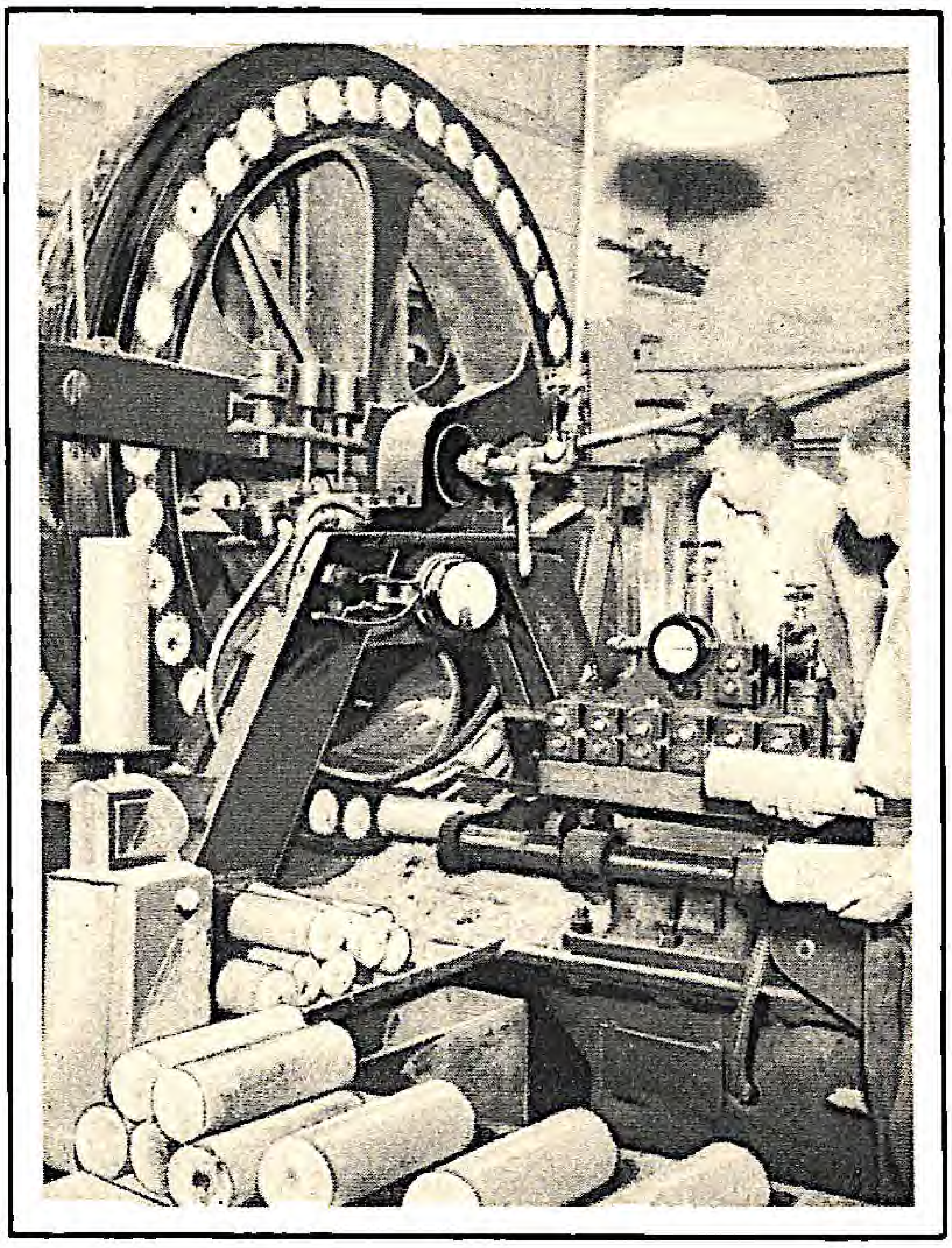


Four hooks are fastened to chair corners and tightened by swivel.

WOBBLY chairs that are actually "on their last legs" can be redeemed for years of service through the use of a new chain stay that is entirely invisible after it has been applied beneath the chair seat. The stay is made of four lengths of chain fastened to a center swivel for adjusting purposes. Four special bolt hooks, one on each chain, extend to the four corners of the chair. When the hooks are fastened, the slack in the chains is taken up by turning the center swivel. This draws the loose joints firmly together where they will be held without the aid of glue or nails.

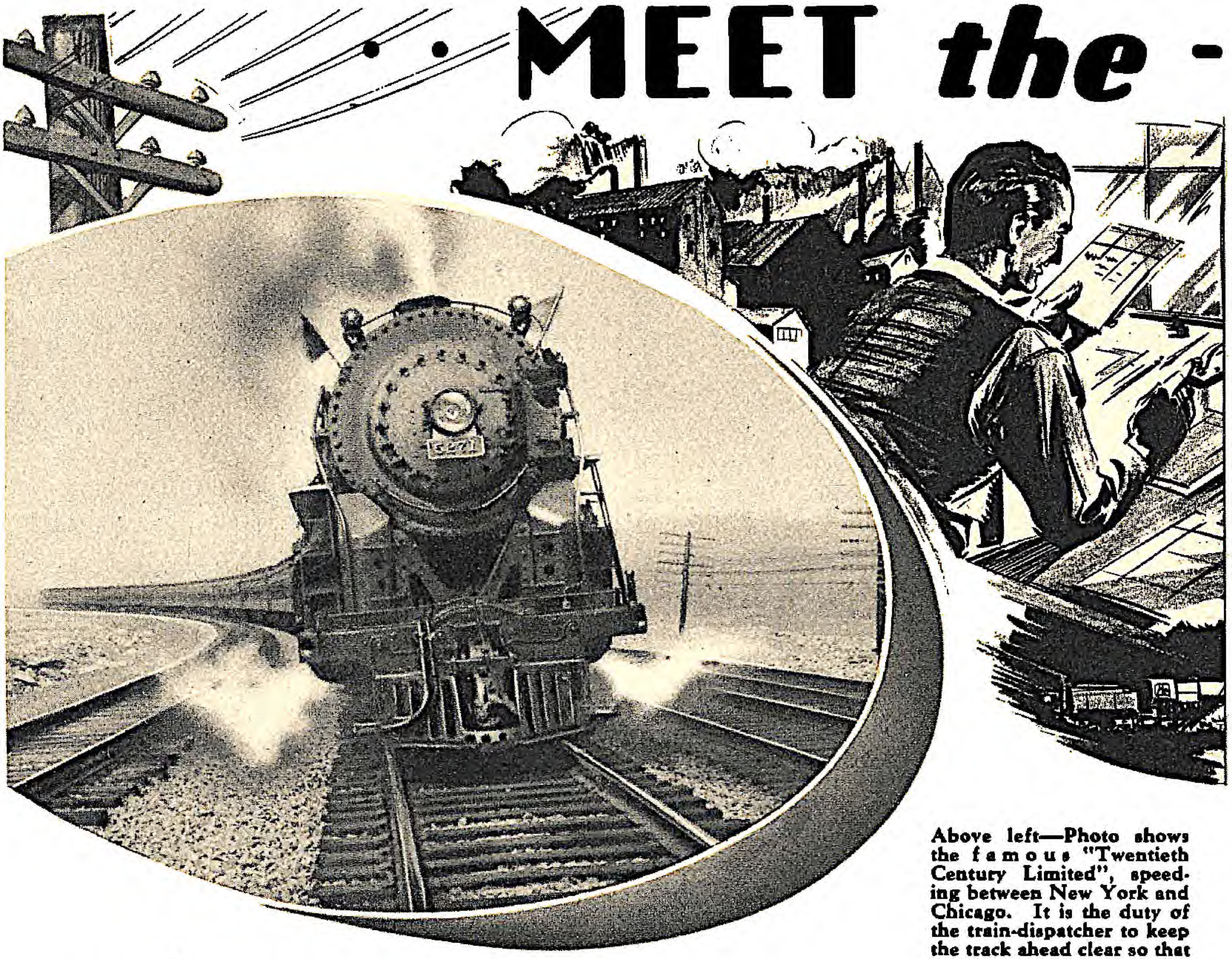
Machine Makes Wood from Sawdust

REVERSING the old process of cutting wood into fireplace length, a new machine has been constructed to build up firewood from lumber shavings and sawdust. And, to cap the climax, it does a better job than nature by creating pieces three times as dense as ordinary lumber. The sawdust and wood scraps are moistened and submitted to a pressure of 185,000 pounds. They are compressed nine times and forced through a wheel which clips them into firewood lengths ready for drying and stacking.



Nine volumes of sawdust are compressed into one log. The logs are forced through the above wheel in firewood lengths.

MEET the -



Above left—Photo shows the famous "Twentieth Century Limited", speeding between New York and Chicago. It is the duty of the train-dispatcher to keep the track ahead clear so that there will be no delay in the regular schedule times.

by

ALLEN DALE

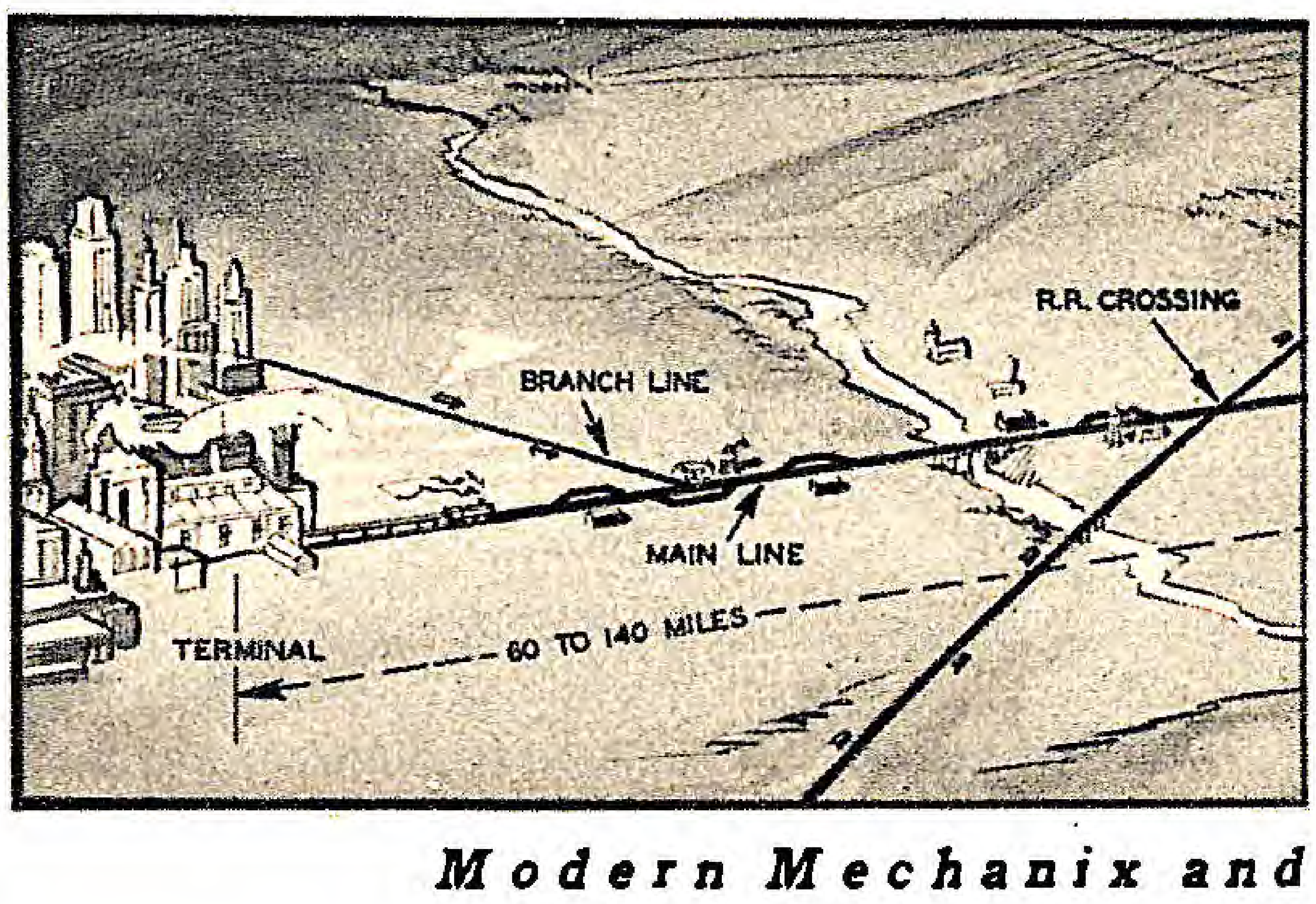
WITH a whistle of air-brakes, a seven-car "local" swings carefully onto a side-track at Mowbry Junction. At the moment, no danger is in sight—yet two minutes later, with a thundering roar and a heavy speed that shakes the earth, the iron-clad "flyer" flashes past to disappear almost instantly, enveloped in a cloud of smoke and flying cinders.

Had the "local" remained on the track two minutes longer, there would have been a devastating crash—death and ruin.

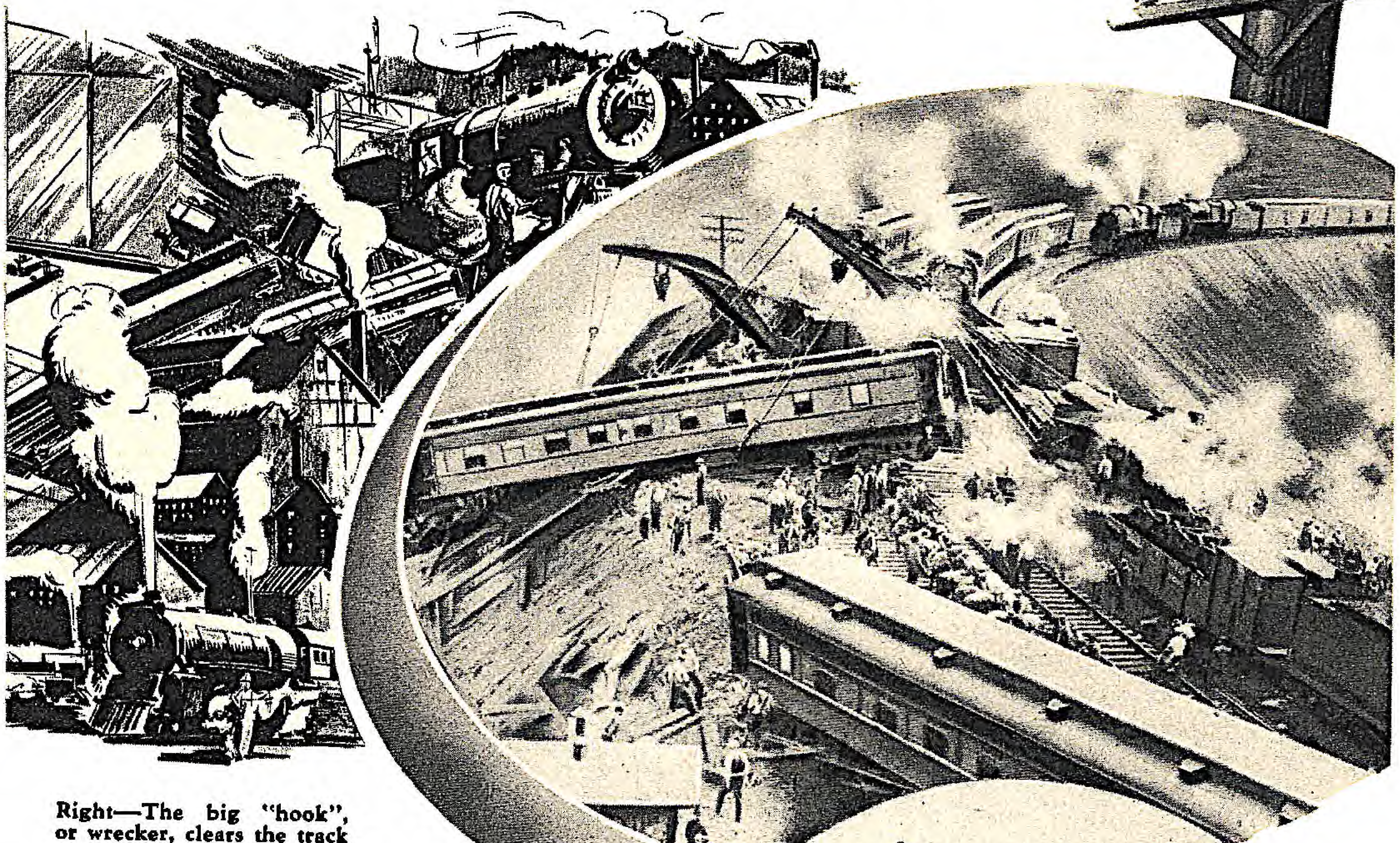
So infrequent are collisions that the public does not worry about them. But there is one man who does all the worrying—who guides the destinies of speeding trains and splits seconds to arrange their meetings.

In an office at some point on the superintendent's division he sits erect at a table. A transparent green visor shades his eyes as he studies a broad sheet in front of him. This sheet is lined and interlined, crossed-criss-crossed and scored with spaces that provide a record of movement for each and every train on the road for a period of twenty-four hours beginning and ending at midnight.

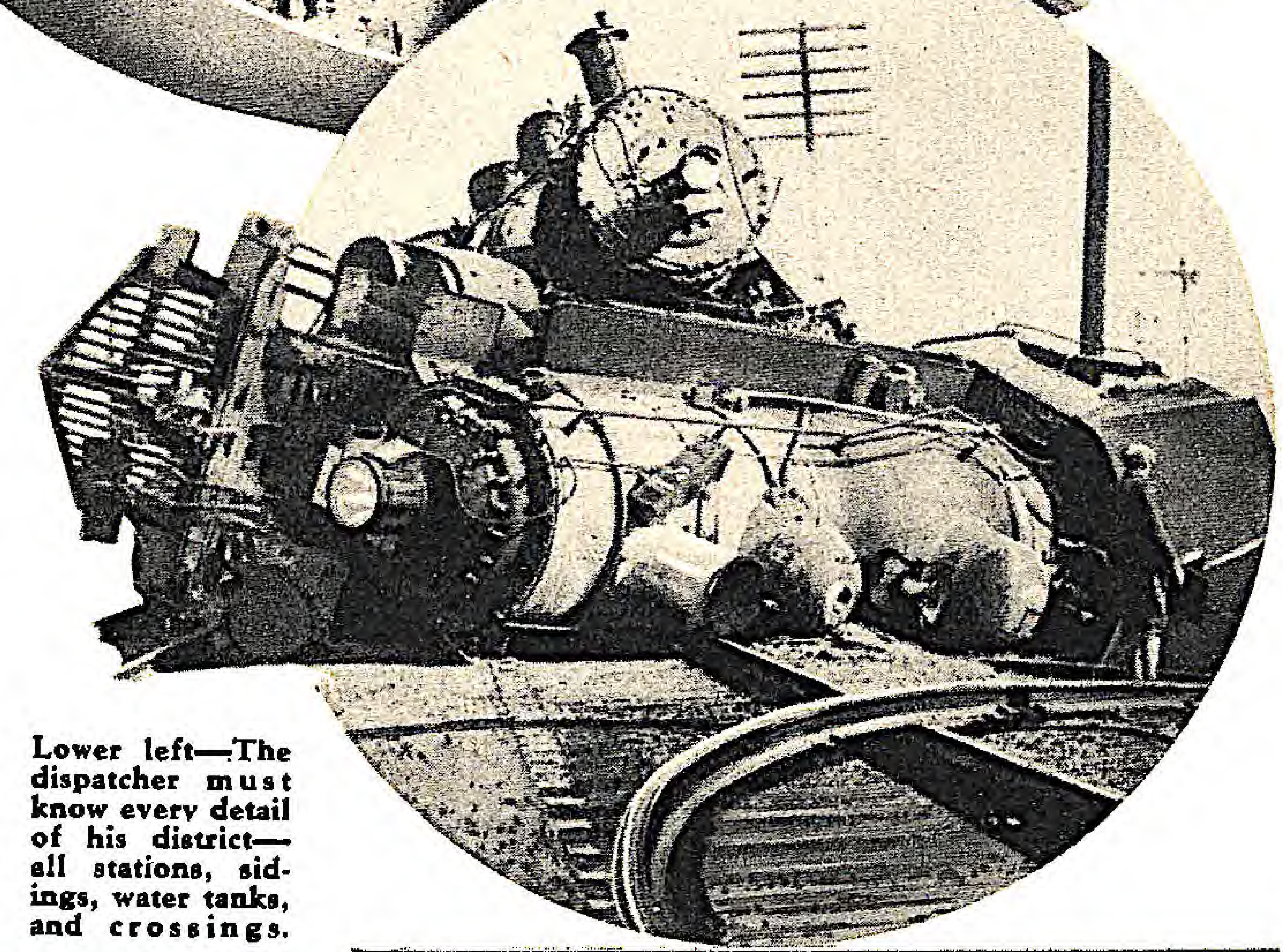
He is a busy man, this fellow who is designated as a Train Dispatcher; busy as a trap drummer in a jazz orchestra. He carries more responsibility on his shoulders during the eight hours he works than falls to the lot of an ordinary mortal in a year. You don't hear much about him, because the public is excluded from his domain. He hasn't time to be bothered, for one thing, and it would be dangerous if he were allowed to be. He has lives at his finger ends—hundreds of them each day he works—not to mention a fortune in equipment. It would be bad business if he should slip!



DISPATCHER



Right—The big "hook", or wrecker, clears the track to maintain fast traffic. In circle—Two passenger trains collide on a crosstrack. Dispatchers must guard against such costly and delaying accidents.

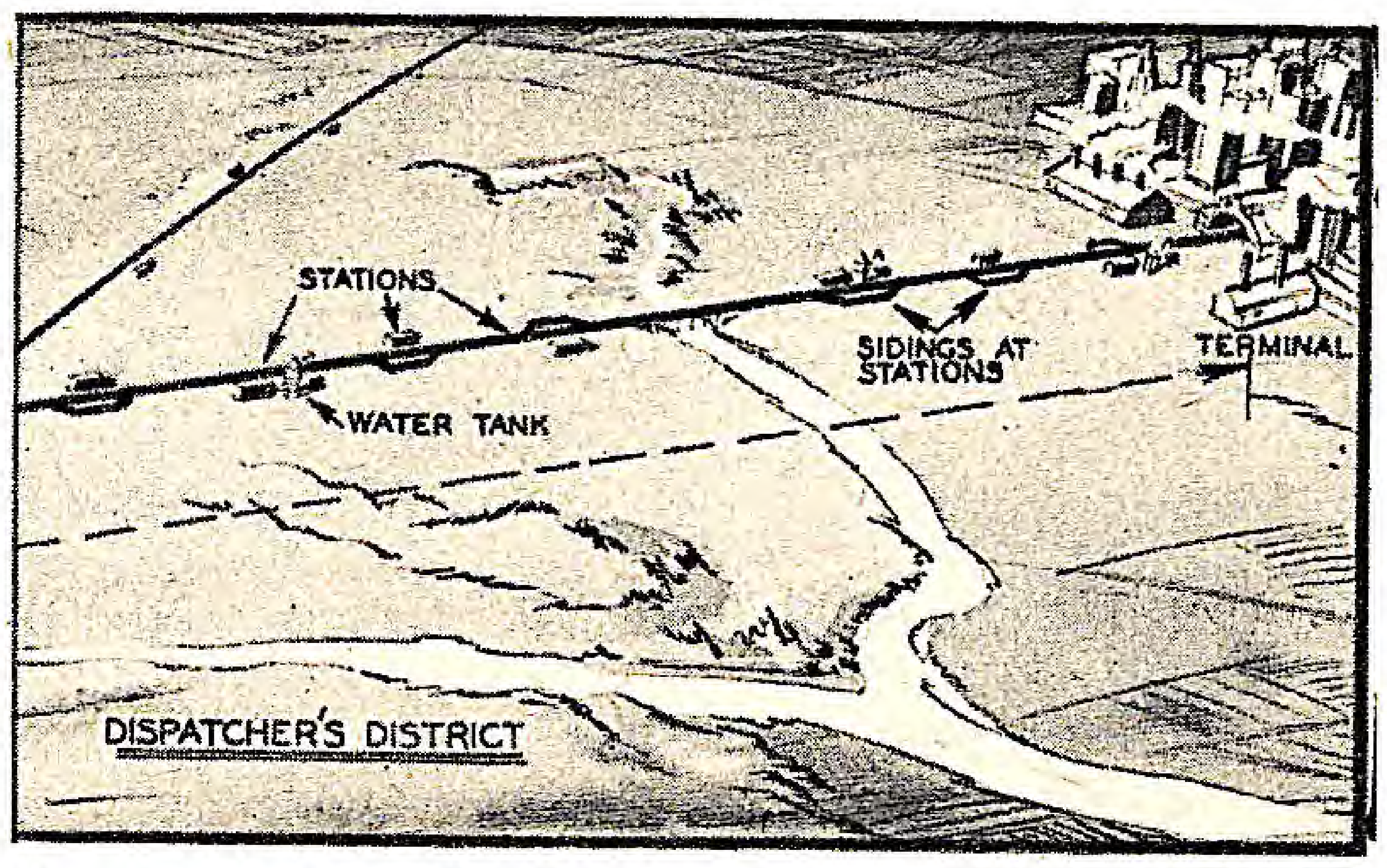


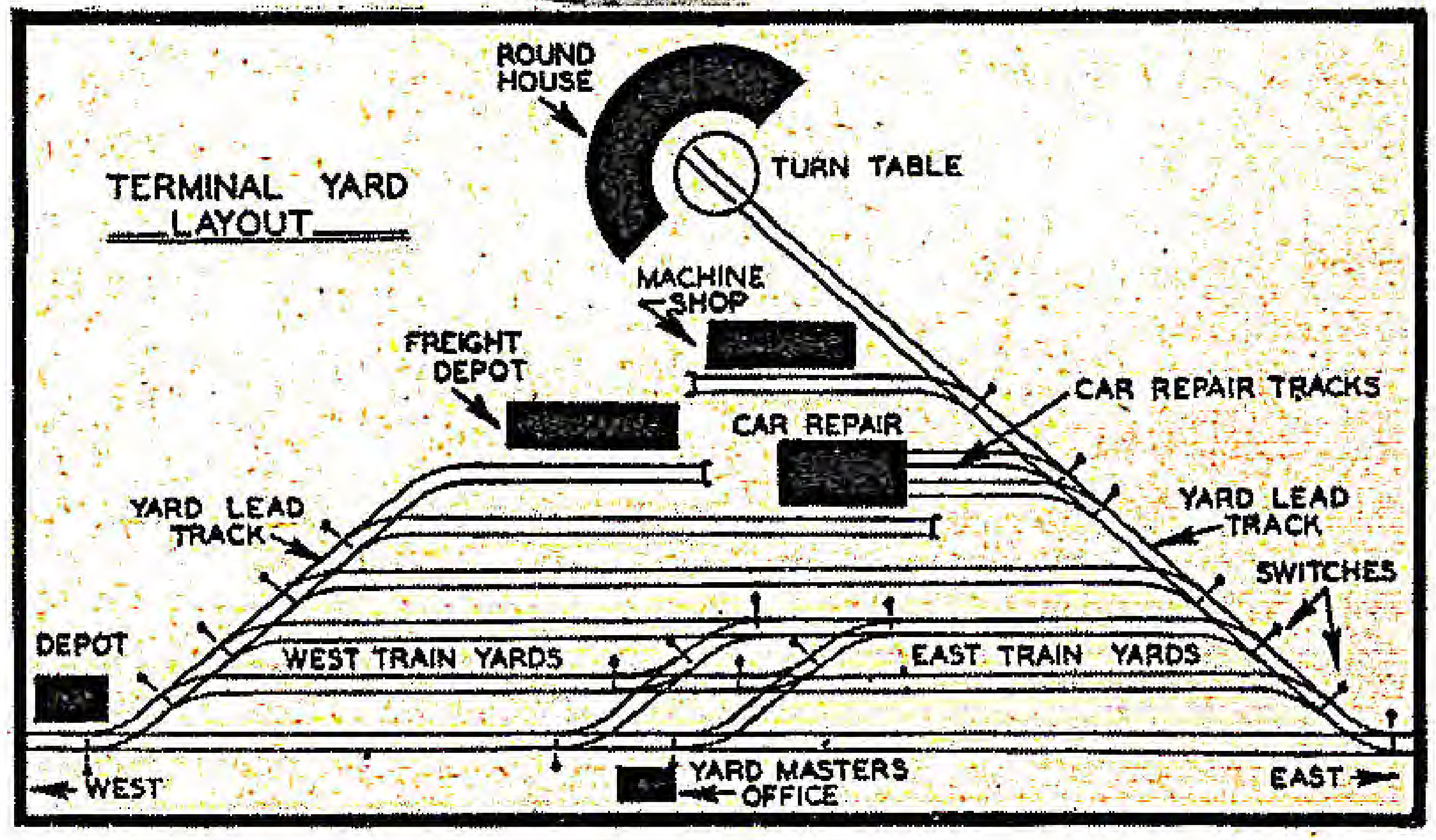
He figures his traffic, estimates speed, operating delays, weather conditions—and makes his meeting points from that deduction. He sends his orders to the operators along the line out of his head and copies them either as they are transmitted in Morse code or as the first operator repeats them over a telephone.

For hours he sits tensely

[*Continued on page* 118]

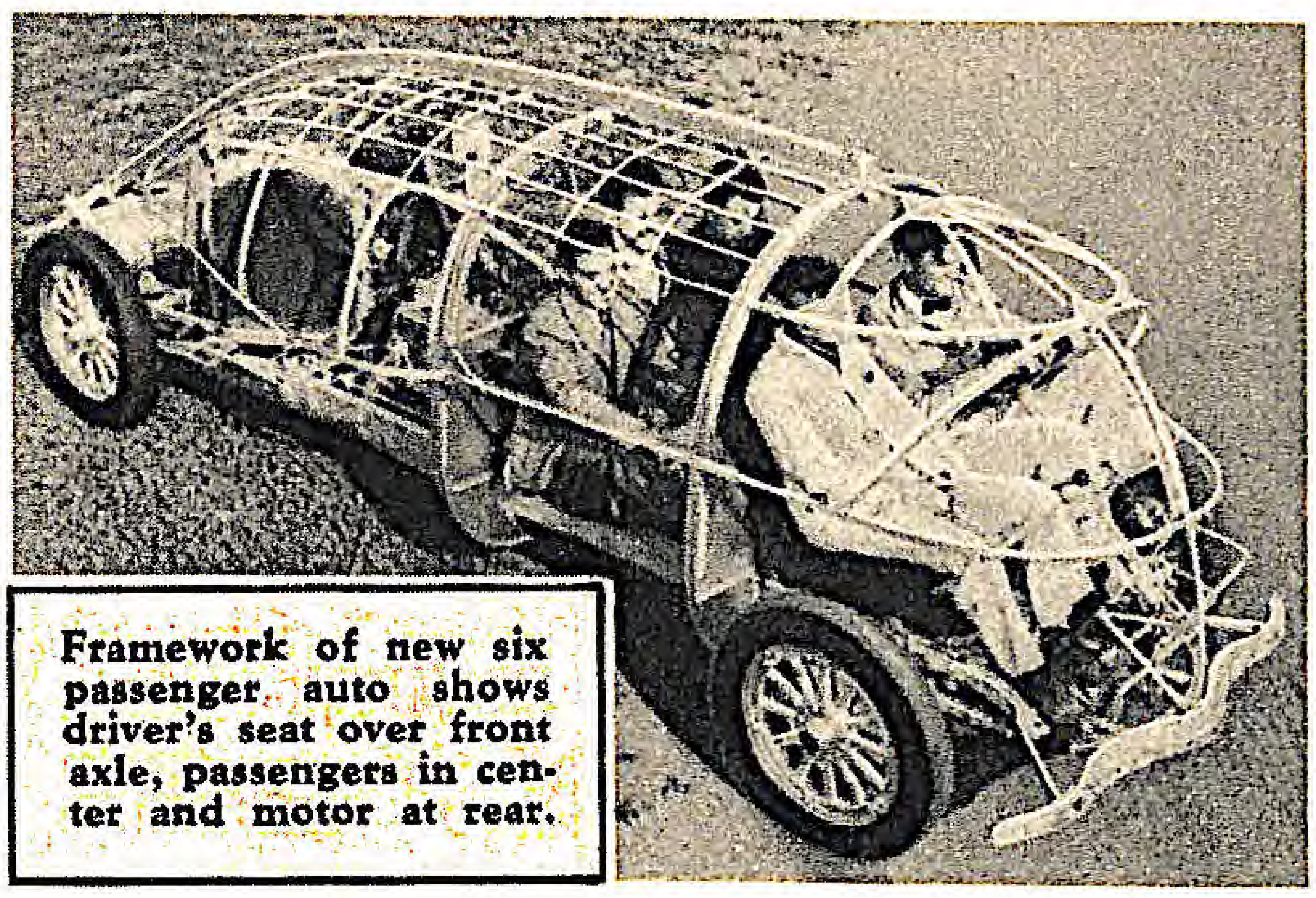
Lower left—The dispatcher must know every detail of his district—all stations, sidings, water tanks, and crossings.


STATIONS
SIDINGS AT STATIONS
TERMINAL
WATER TANK
DISPATCHER'S DISTRICT


TERMINAL YARD LAYOUT
ROUND HOUSE
TURN TABLE
MACHINE SHOP
FREIGHT DEPOT
CAR REPAIR TRACKS
CAR REPAIR
YARD LEAD TRACK
YARD LEAD TRACK
SWITCHES
DEPOT
WEST TRAIN YARDS
EAST TRAIN YARDS
WEST
YARD MASTERS OFFICE
EAST

Above—A representative terminal yard layout showing tracks where trains await the dispatcher's orders to move.

Teardrop Auto Has Rear Mounted Motor


Framework of new six passenger auto shows driver's seat over front axle, passengers in center and motor at rear.

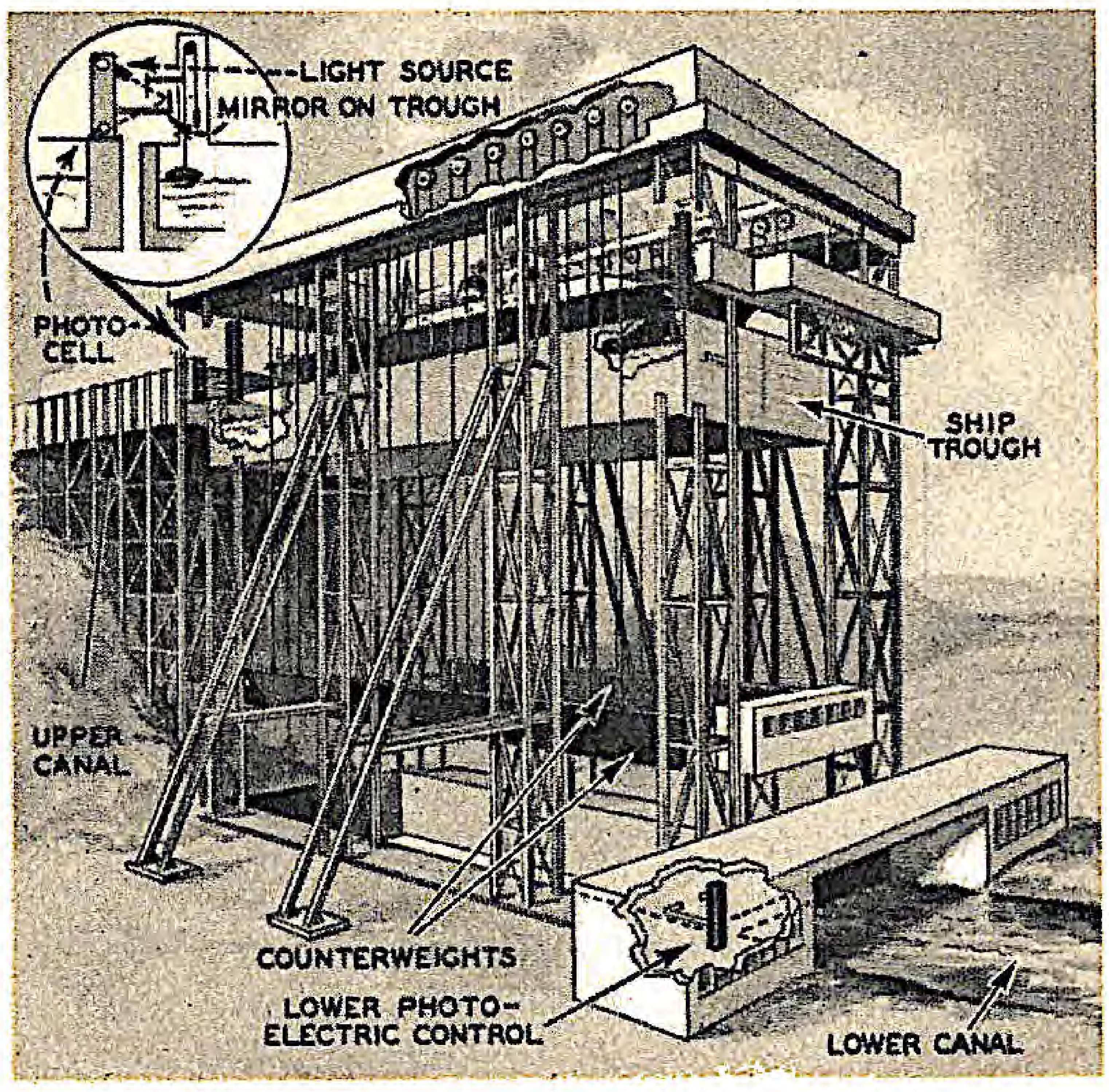
FOLLOWING closely the "teardrop" design, a "car of the future," built by Allen M. Hoppe and Allyn F. Streur, features a rear-mounted motor which takes no more room than the trunk on the conventional present day automobile.

The driver's seat is located directly over the front axle; running boards and fenders are eliminated to lessen air resistance. Horizontal and vertical fins set into the rear stabilize the auto to permit high speeds on curves.

Photo-Cell Stops Ship Elevator

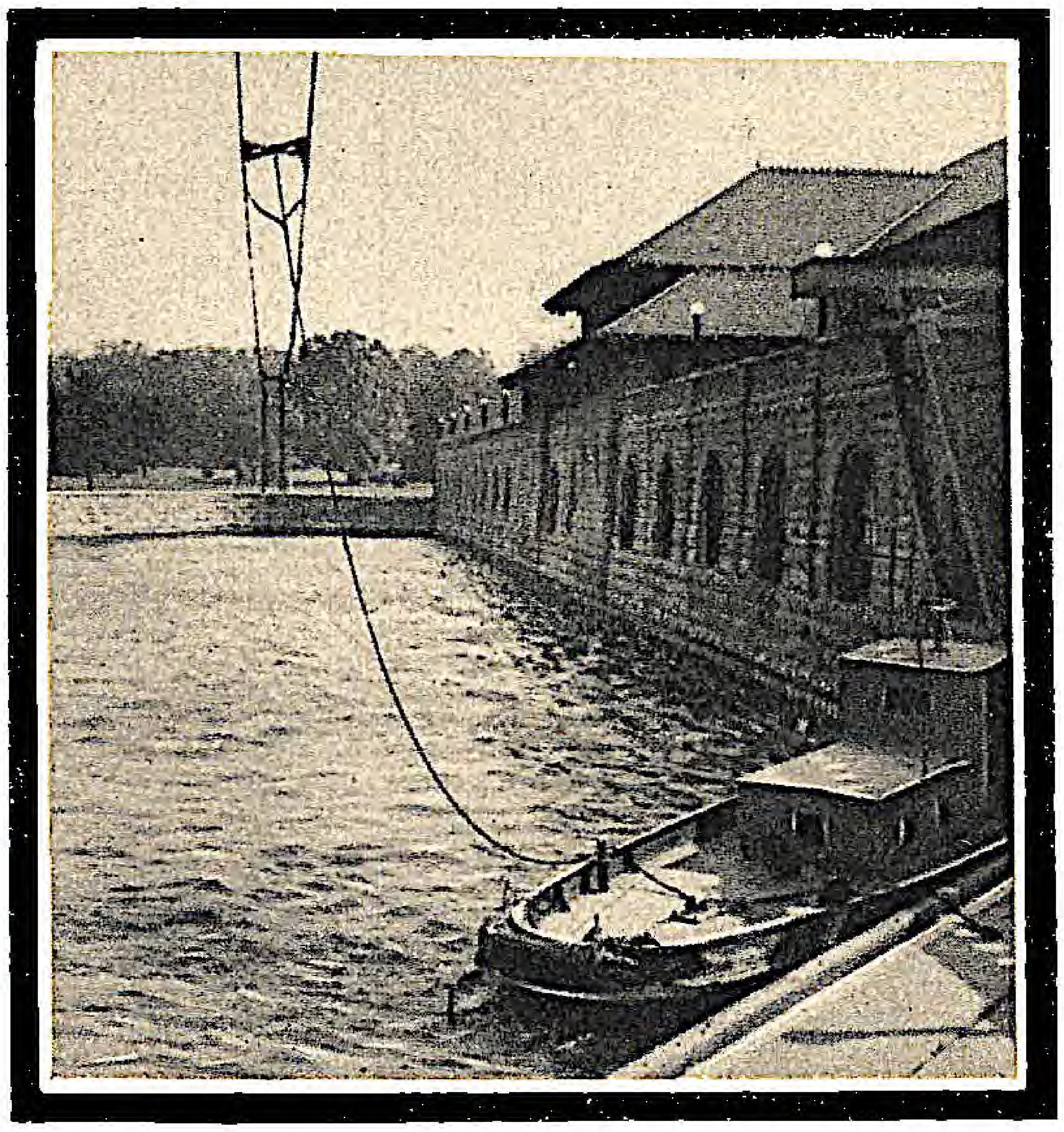
PERHAPS the most unique navigation structure in the world, a huge trough-like elevator that raises and lowers barges from one water level to another, is located at Niederfinow, near Berlin, Germany. More unique is the fact that this huge trough, 4,300 tons in weight, is controlled by a tiny beam of reflected light which falls on an electric-eye to stop the movement of the trough when the water-level inside correlates with the water level in the canal.

The light beam is fixed at both top and bottom of the elevator. A fixed mirror on the trough reflects the ray into a photo-cell when the correct relative position is obtained. When the contact is made, the cell operates relays to stop the lifting machinery. Gates are then opened to allow the barges to move into or out of the elevator.



A ray of light, reflected by a mirror into a photo-cell, stops this huge water-filled elevator trough at the canal levels.

Boat Operates From Trolley Wire


Above boat is powered from an overhead trolley and is used to keep floating refuse from entering power-house turbines.

WHILE the ordinary trolley car is a sight familiar to most people and the trolley bus is becoming quite common, there is one trolley arrangement that never fails to arouse comment. It is the trolley boat located in the intake pond of the Canadian Niagara Power Co. power house at Niagara Falls.

Silently nosing its way around the pond, it is bound to attract attention from boatmen accustomed to the snappy detonations of the outboard motor and the mighty roar of higher-powered gasoline engines used on speed boats.

The trolley boat takes its power directly from the power-plant and is used, practically without expense, to keep the pond clear of weeds and floating debris which might get into the turbines and cause breakdowns.

Bee Sting Makes Youth Human Film

WITH a skin as sensitive as a photographic film, Robert J. West sunburns severely after a few minutes exposure to sunlight. In an effort to diagnose his own ailment he has switched his studies in the University of California to a course of physiology.

No part of his body is immune in its reaction to sunlight; exposed for a period of three minutes, his skin crisps and forms painful blisters. Consequently, when in the open, he either muffles himself in a heavy overcoat and pulls his hat low over his eyes, or he insulates himself with a covering of red, sun-resistant Cellophane.

He drives to and from school in a darkened car, and carries on his class-room work with red Cellophane curtains over all windows, as even glass will not protect his super-sensitive skin.

Insofar as physicians have been able to determine, this strange condition was brought about through a bee sting which West suffered while working in his garden. It is believed that some infection has set into the blood stream that is ultra sensitive to the blue ray in sunlight. As yet, blood tests have revealed no conclusive irregularities in the youth's makeup.

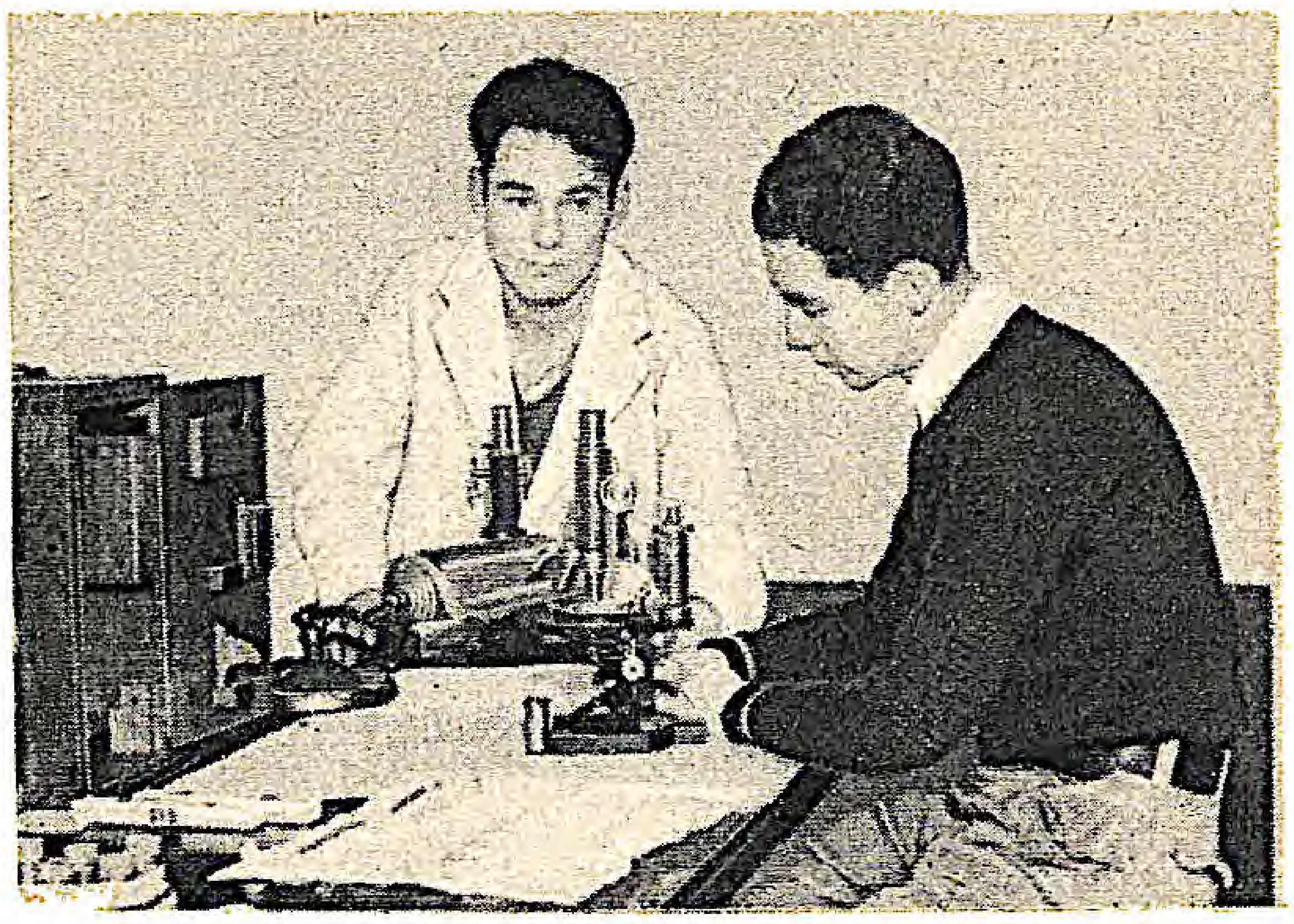
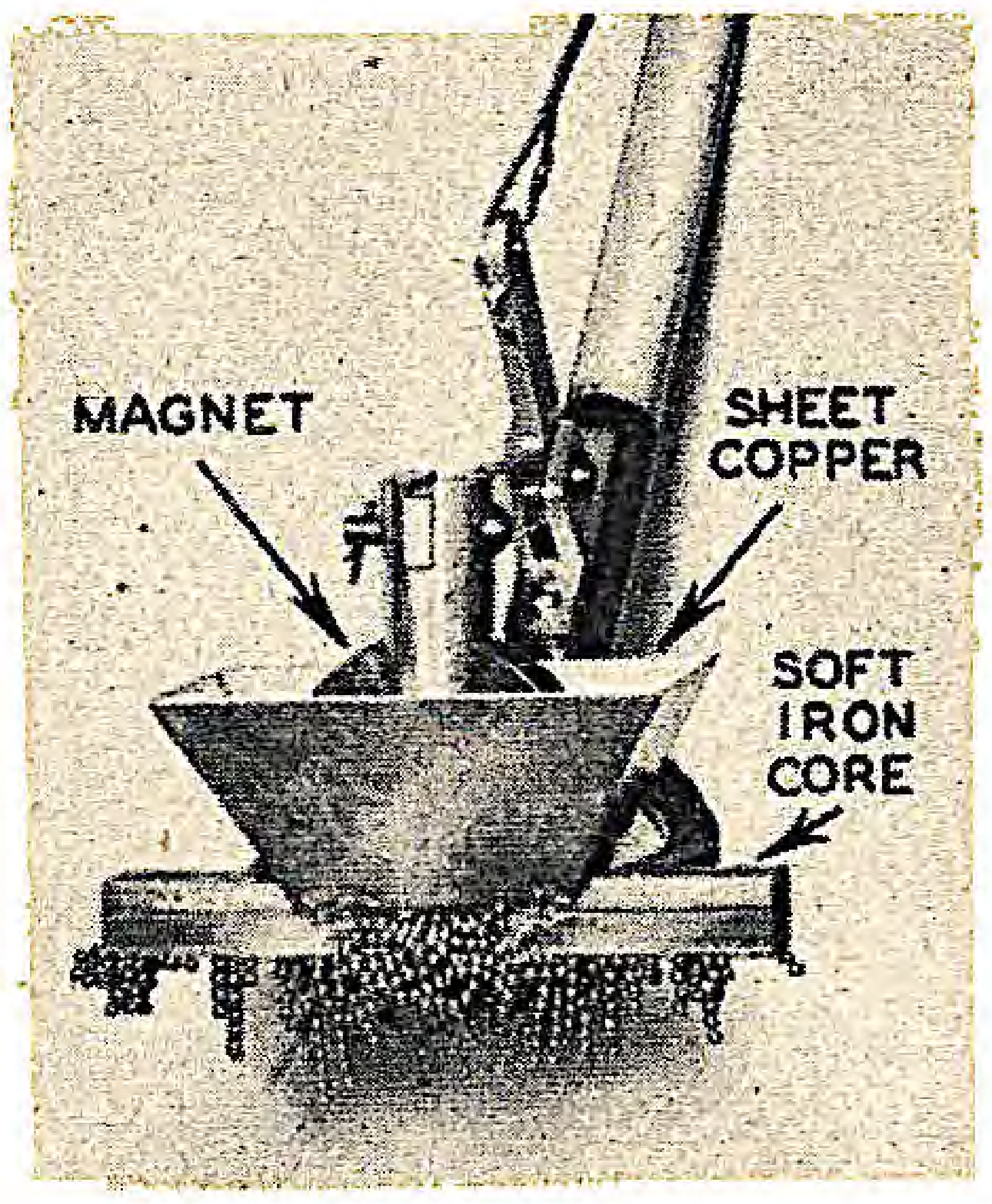


Photo shows Robert West studying in a room with windows covered with red cellophane to protect his skin from sunburn.

Magnet Picks Up Metal Scraps



Above magnet mop picks up metal scraps and drops them when the movable magnet is finally lifted.

FINDING that small pieces of ballbearing and steel scraps rolled under bristle brooms, W. E. McKibben, has invented a magnetic sweeper, an electrical mop, that clears the floor of metal scraps with a minimum of work. Using an ordinary mopstick as a handle, he equipped it with a sliding magnet, a sheet copper insulation, and a soft iron core. The magnet is controlled by a wire attached to the handle. When the magnet is down, it magnetizes the iron core which picks up the metal; when the magnet is raised, the iron core releases the metal to fall in the refuse receptacle.

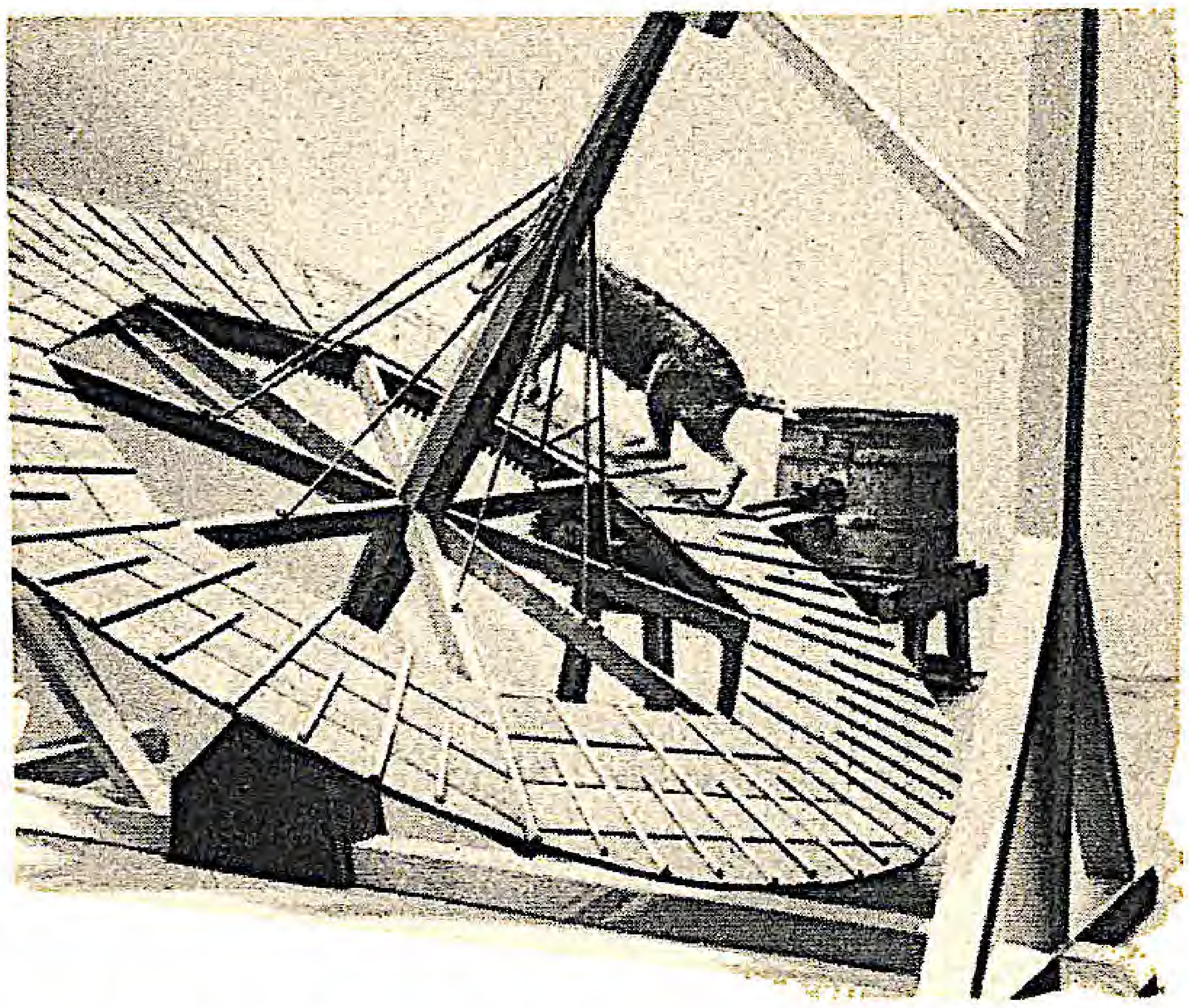
Claims Salt Crust Covers Moon

THE gigantic craters to be observed on the face of the moon are caused by the collapse of vast domes of salt, according to a theory recently advanced by Dr. F. Leitich, Austrian geologist. He believes that just as a desert is covered by sand, the moon is covered by salt.

Dog Powers Unique Machine

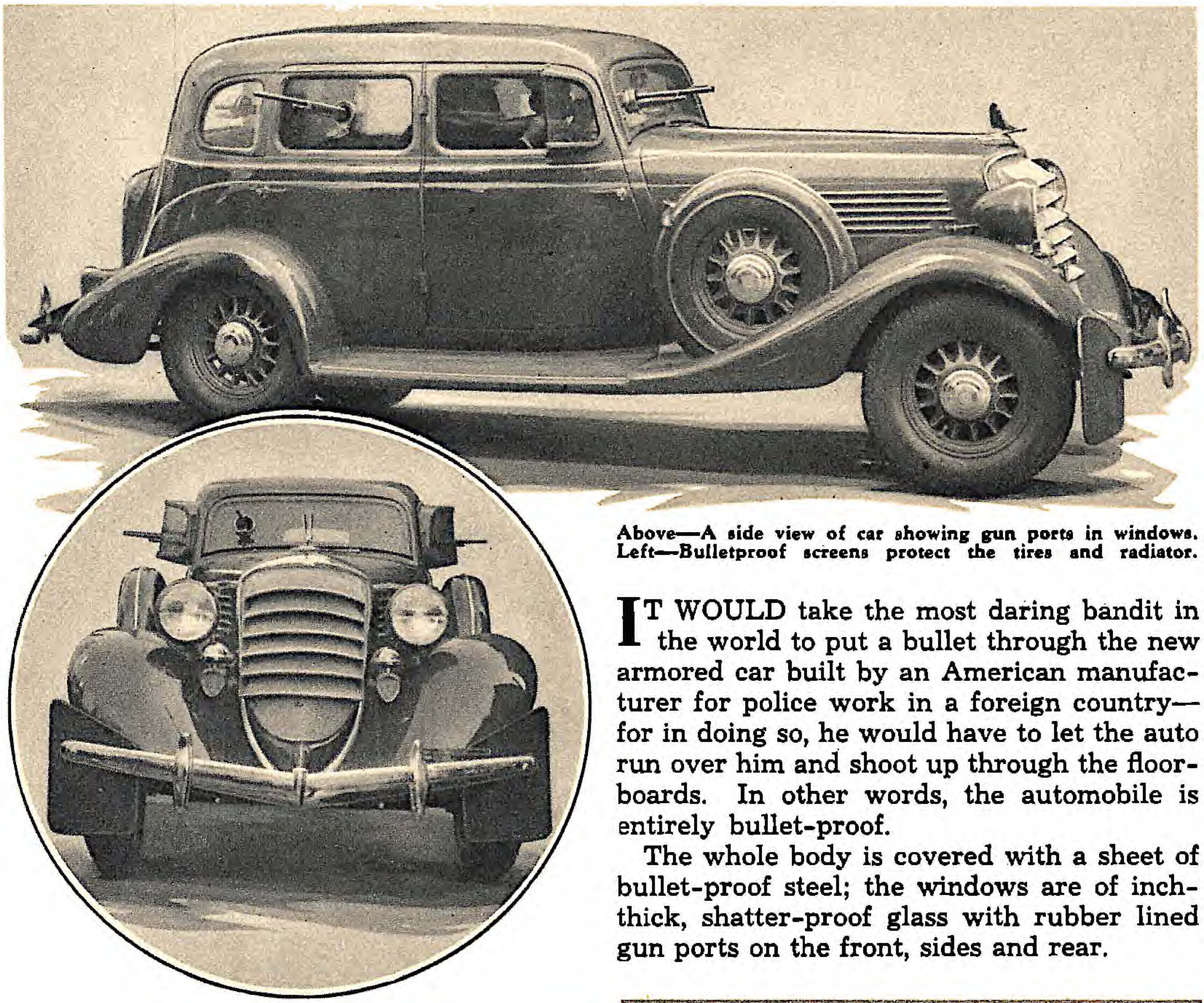
QUEER old dog wheels that utilize the power created by a dog walking on a tilted wheel to pump water and operate grinders are still to be found in use in West Wales, England.

These queer wheels are treaded to afford the dog perfect footing. Gears under the wheel mesh with machine gears to complete the power conversion.



A dog, walking on this wheel, remains stationary; the geared wheel moves under him, making power to operate machinery.

Heavily Armored Police Car Is Immune To Bandit Bullets



Above—A side view of car showing gun ports in windows. Left—Bulletproof screens protect the tires and radiator.

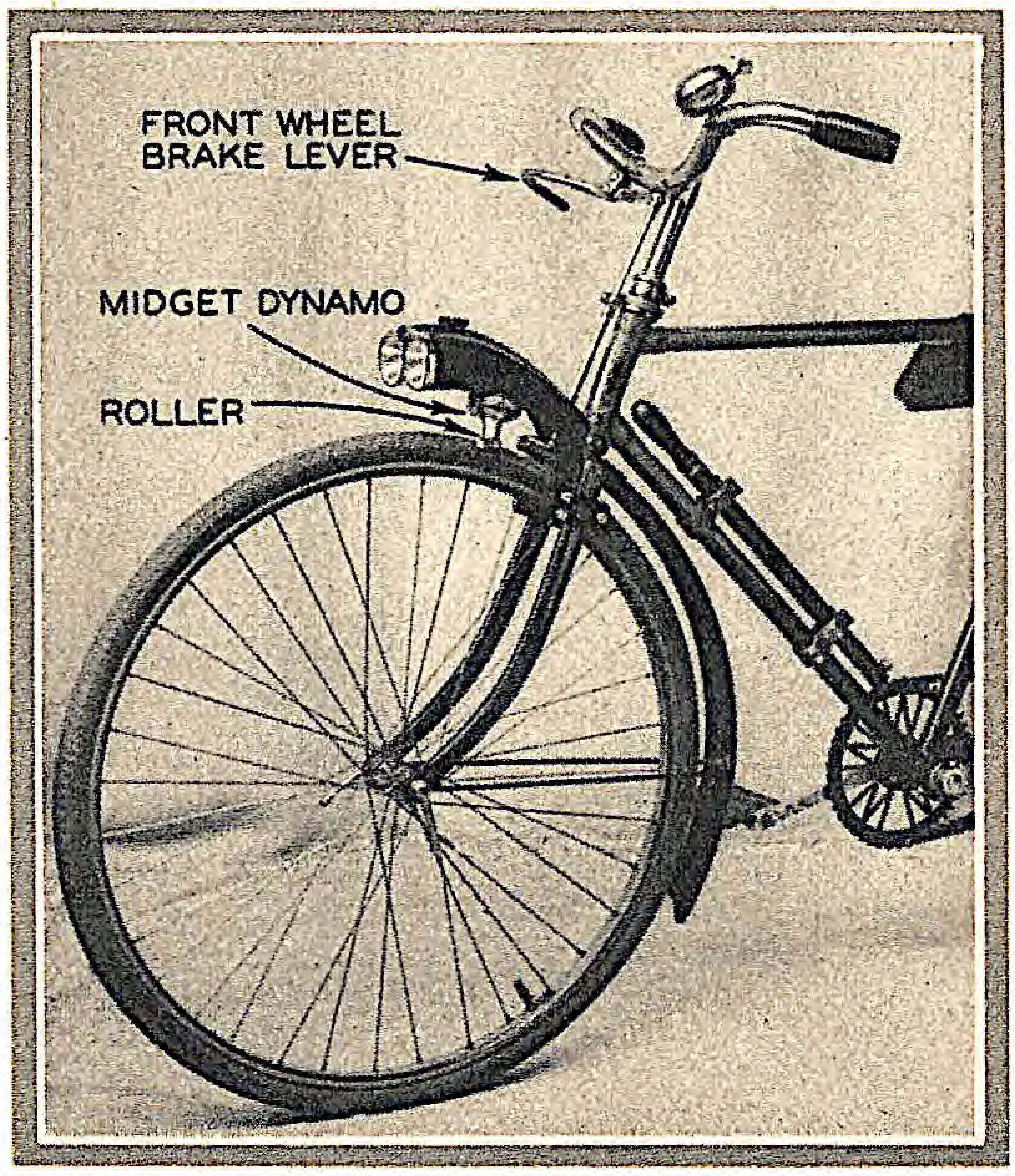
IT WOULD take the most daring bandit in the world to put a bullet through the new armored car built by an American manufacturer for police work in a foreign country—for in doing so, he would have to let the auto run over him and shoot up through the floorboards. In other words, the automobile is entirely bullet-proof.

The whole body is covered with a sheet of bullet-proof steel; the windows are of inch-thick, shatter-proof glass with rubber lined gun ports on the front, sides and rear.

Bike Makes Power For Own Light

CREATING its own electrical current as the wheel turns, a bicycle light, set over the mud-guard is said to provide powerful illumination on the roadway ahead.

The light contains two separate bulbs set ahead of a midget dynamo and focused onto the road as desired. A roller, set lightly in contact with the tire, spins an armature to manufacture current. When not in use, the roller may be lifted from the tire to save needless wear of the generator.

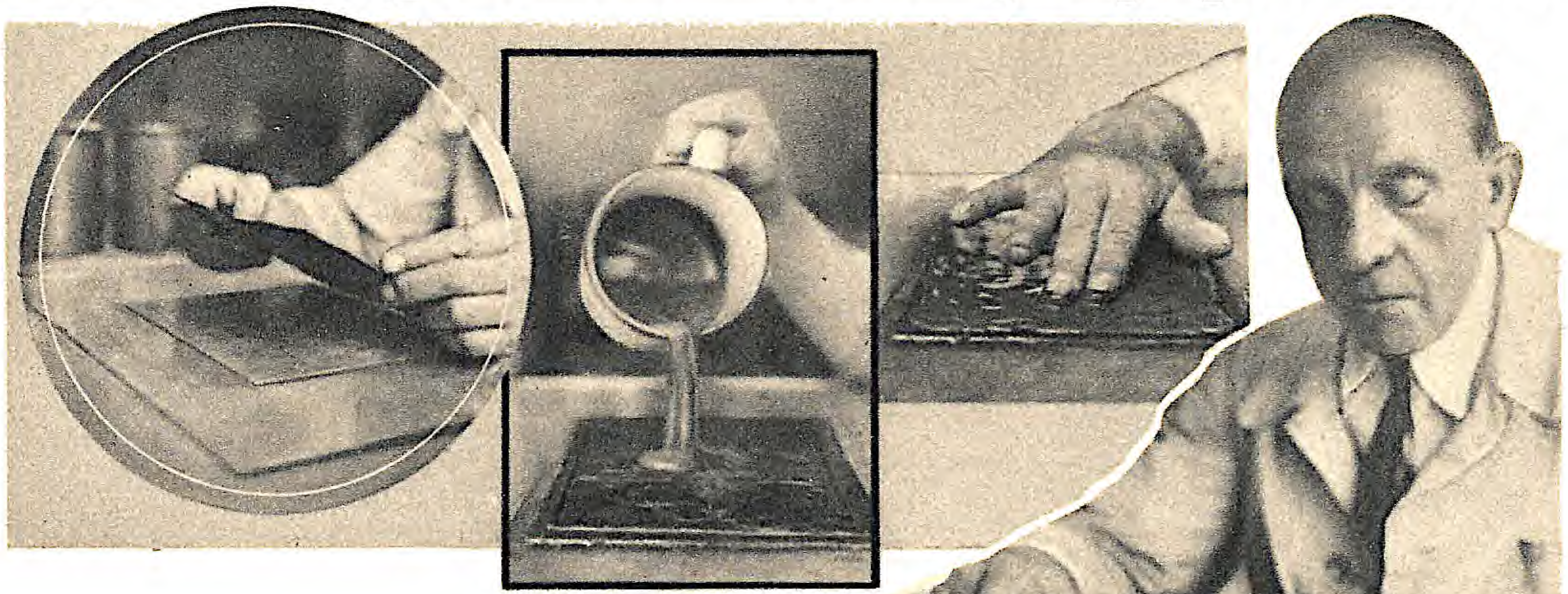


Above photo shows bike light installed. The roller rests against the tire and spins to generate current for light.

Group To Seek Blackbeard's Gold

ANOTHER treasure hunting group, headed by Herbert L. Nelson, Georgia contractor, has received permission from the United States government to hunt for the hidden treasure of the notorious pirate, Captain Blackbeard. They plan to excavate on Blackbeard Island located off the Georgia coast.

Rubber Replaces Metal Newspaper Plates



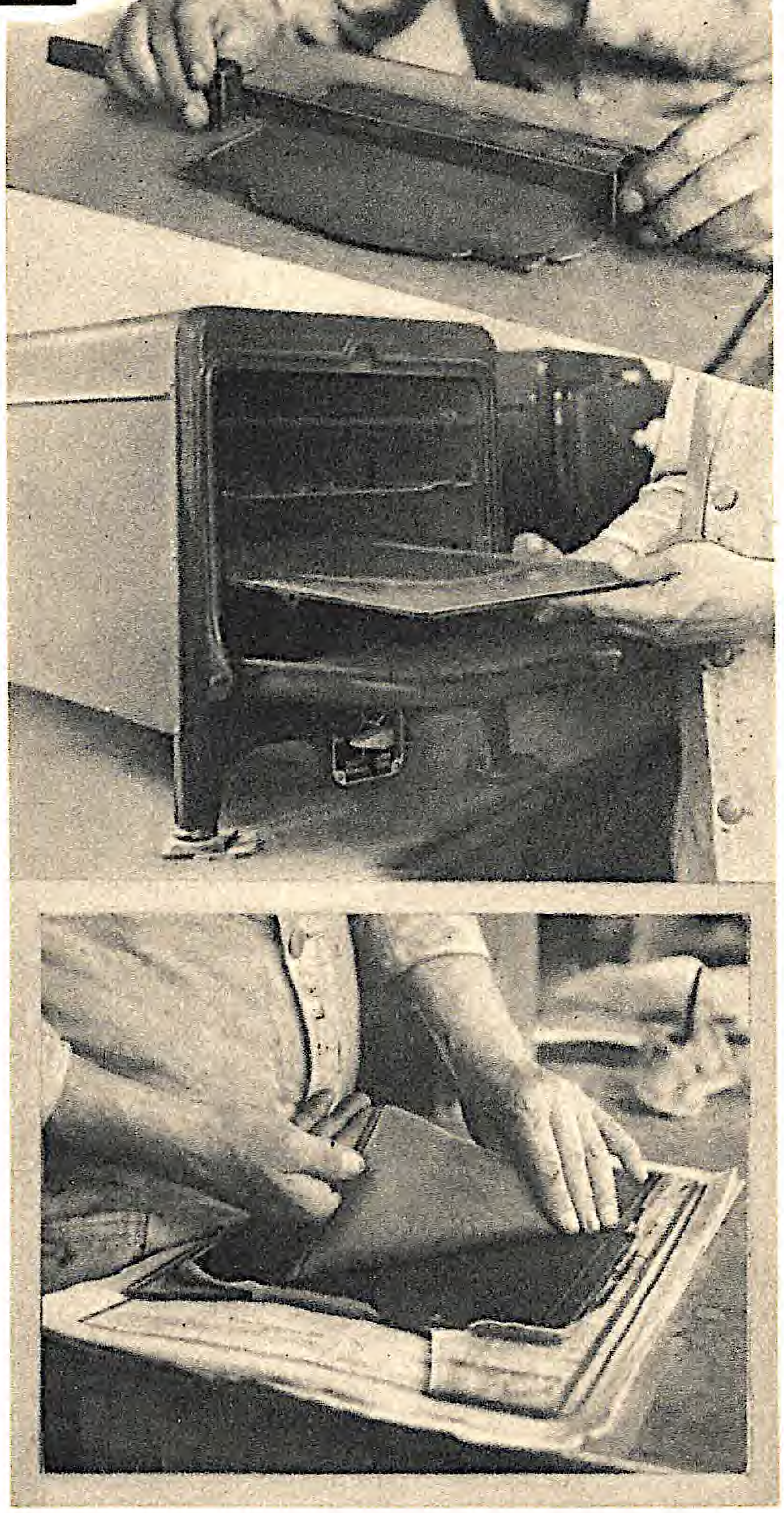
NEWSPAPER presses throughout the country, roaring along at top speed, will soon be able to roll off colored sections, comics and pictures with unusually sharp detail, using rubber plates for direct printing in place of ordinary metal plates. Developed recently in Germany, such fine screen rubber half-tones, employing a minimum of printing ink, are able to make a satisfactory impression on almost any kind of surface without the usual makeready.

Preparation of the rubber plates does not require extreme technical skill and may be accomplished in eight to ten hours. This permits reproducing news pictures taken on the preceding day.

The process is simple and may make it possible for newspapers to print their own rotogravure sections on ordinary rotary presses. The mat, containing the impression, is glued to a glass plate and the edges rimmed with a ⅛-inch thickness of putty to provide a mold for holding the liquid rubber. Some of the solution is then poured in the center of the mat and spread quickly over the entire surface with the finger. Three additional layers are applied and finally smoothed with a brass leveling stick.

The plate is then set aside for about six hours, after which time it is baked in a hot oven. When the rubber has cooled, the plate is peeled from the mat and mounted on a wooden or metal base for flat-bed printing or backed with linen, cardboard or zinc, curved and clamped to the rotary press.

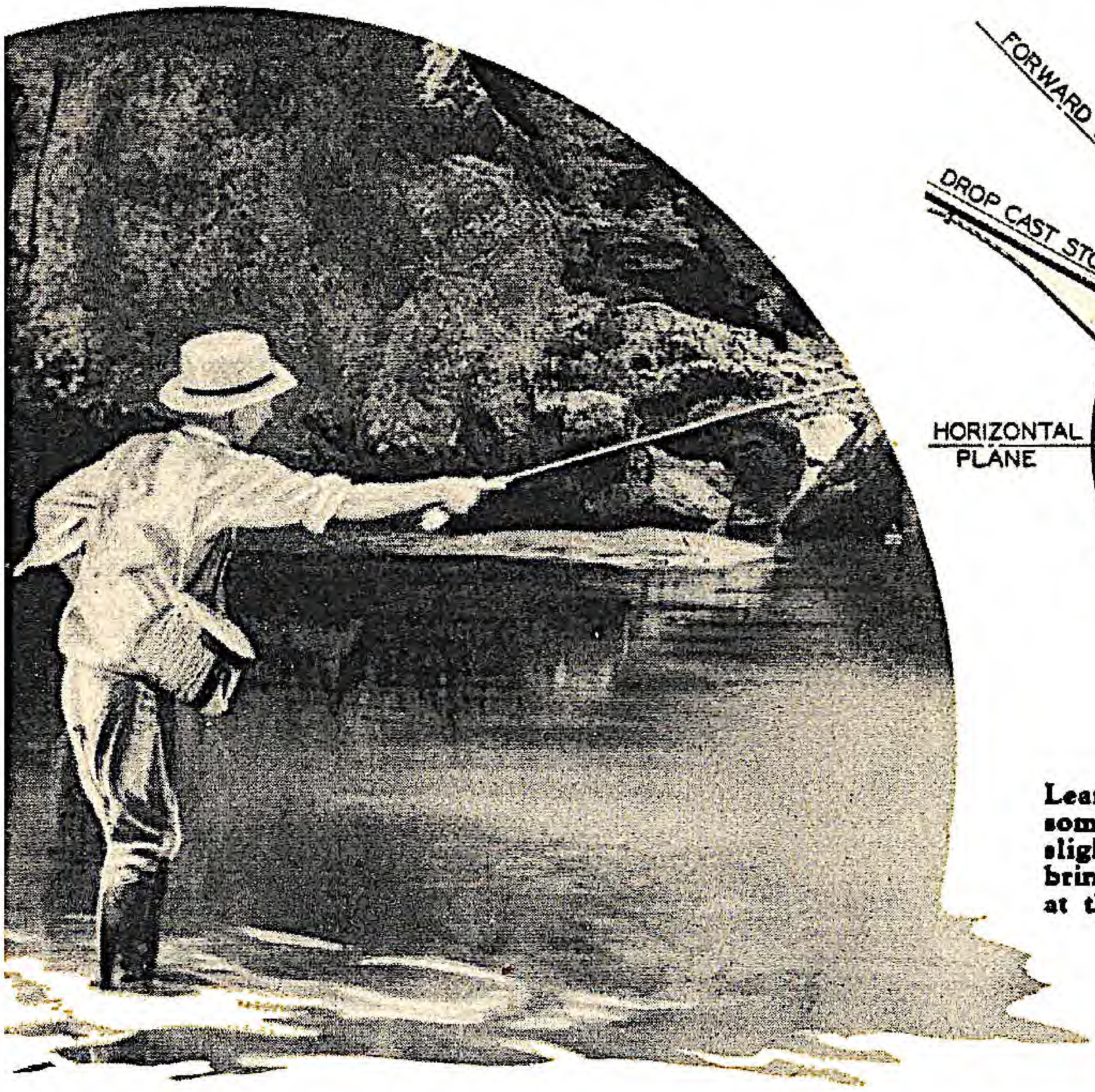
The vulcanized plate, passing lightly over the inked rollers, will print on pulp paper just as distinctly as a fine screen half-tone. Since the process can be handled easily by unskilled workers, actual costs are low.



Above photos follow the method of preparing the rubber plates. Respective steps are shown from upper left to lower right. The mat is carefully glued to plate glass after which the rubber composition is poured on in even layers. It is smoothed carefully with fingers to insure perfect impression and the back is leveled. After setting, it is baked in an oven until hardened. Then it is removed, the mat peeled off and plate is ready for printing.

SPORTSMEN'S

UNFOLDING THE MYSTERIES



The fly caster is "reaching out" to drop fly at distant spot. The novice should try to keep right elbow close to the body.

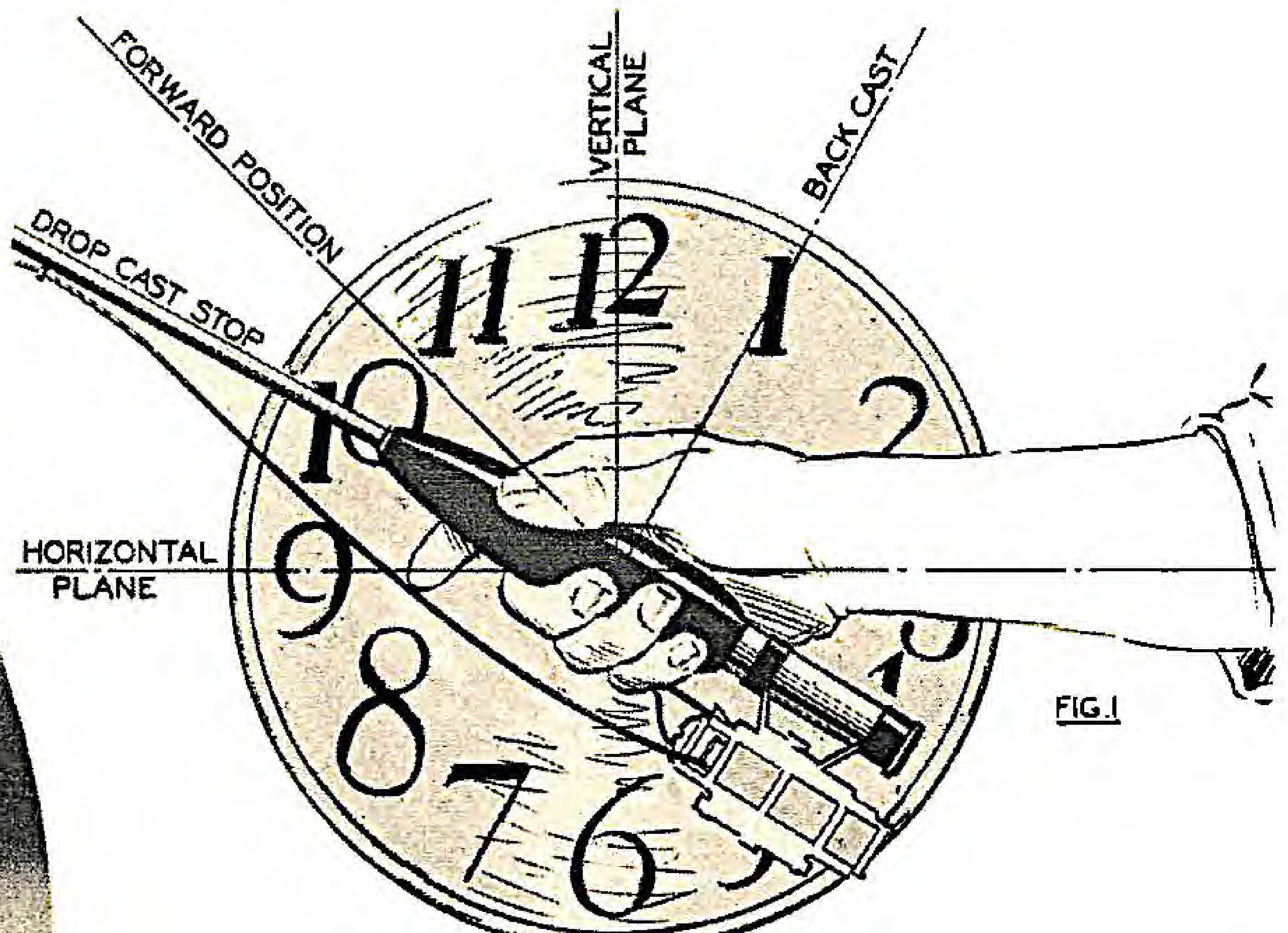


FIG. I

Learning by means of an imaginary clock is recommended by some experts. On the back cast the rod is allowed to go slightly past vertical or one o'clock. After counting four, bring rod forward sharply. The rod is stopped momentarily at the forward position before moving on to drop cast stop.

FLY casting is one of the most difficult of fishing sports, yet it has such an appeal that the sportsman who learns fly casting may become so fascinated by it that he is liable to abandon all other forms of fishing. Fly casting requires patience in early stages of learning, but if the newcomer goes about it correctly he can become as proficient as an expert.

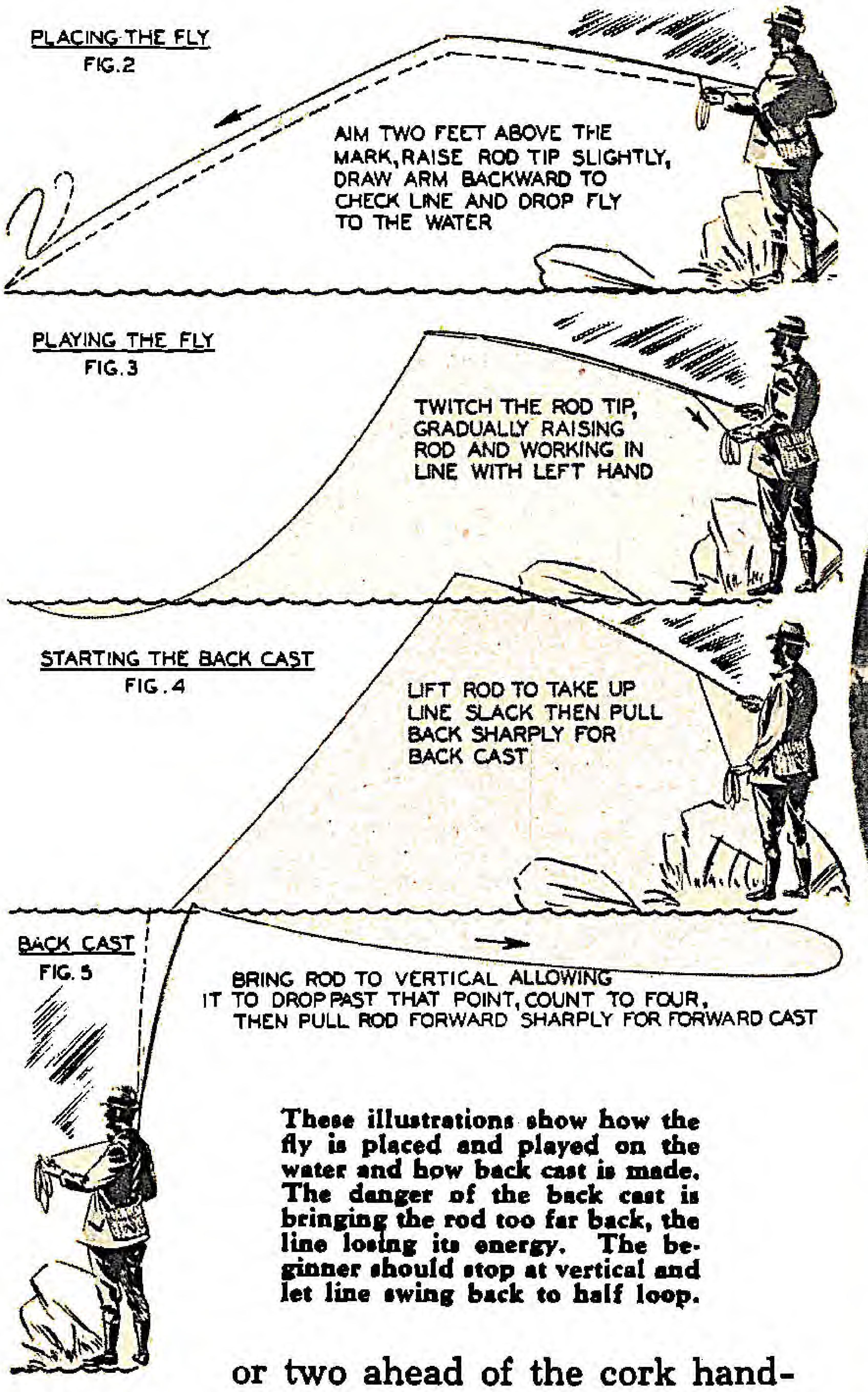
The high-powered angling writer will mention off-hand fifty, sixty and seventy foot casts, as though this were the common thing with the experts and is something that you must live up to if you are to be considered anywhere near perfect. The truth of the matter is that ninety per cent of the trout taken in this country by means of the fly rod are hooked within 30 to 40 feet of the caster's right arm. Only in rare instances is it necessary to go beyond this limit with the reputed 50 and 60 foot casts. Keep this in mind. Keep your eye directed on familiarizing yourself with the casts up to 40 feet from you and forget all about those phenomenally long casts, which have no place in actual fishing, and you will be saving yourself considerable discouragement at the start. A point to keep well in mind is the necessity of providing yourself with a good rod in learning the art of fly casting. A cheap rod has little action, life or resiliency to it. It is safe to say that it is quite impossible to obtain a worthy fly rod under ten dollars in price. The rod priced at fifteen to twenty dollars will be more certain of coming up to required qualifications, and from that figure upwards in price should be all the more worthy of recognition. Some angling writers fail dismally in calling attention to the need of a proper rod with which to learn the art of fly casting. Doing so they leave the student handicapped at the start, for unless the initial directions are properly understood, and the outfit is right, nothing much can be expected.

One must remember to have a proper balance between rod and reel in fly casting. If the reel is too light, the rod will be top heavy. To obtain your proper balance as between the two, let your reel, with the enameled line on it, weigh one and one-half times the weight of the rod. You will find that this will give you a balance point an inch

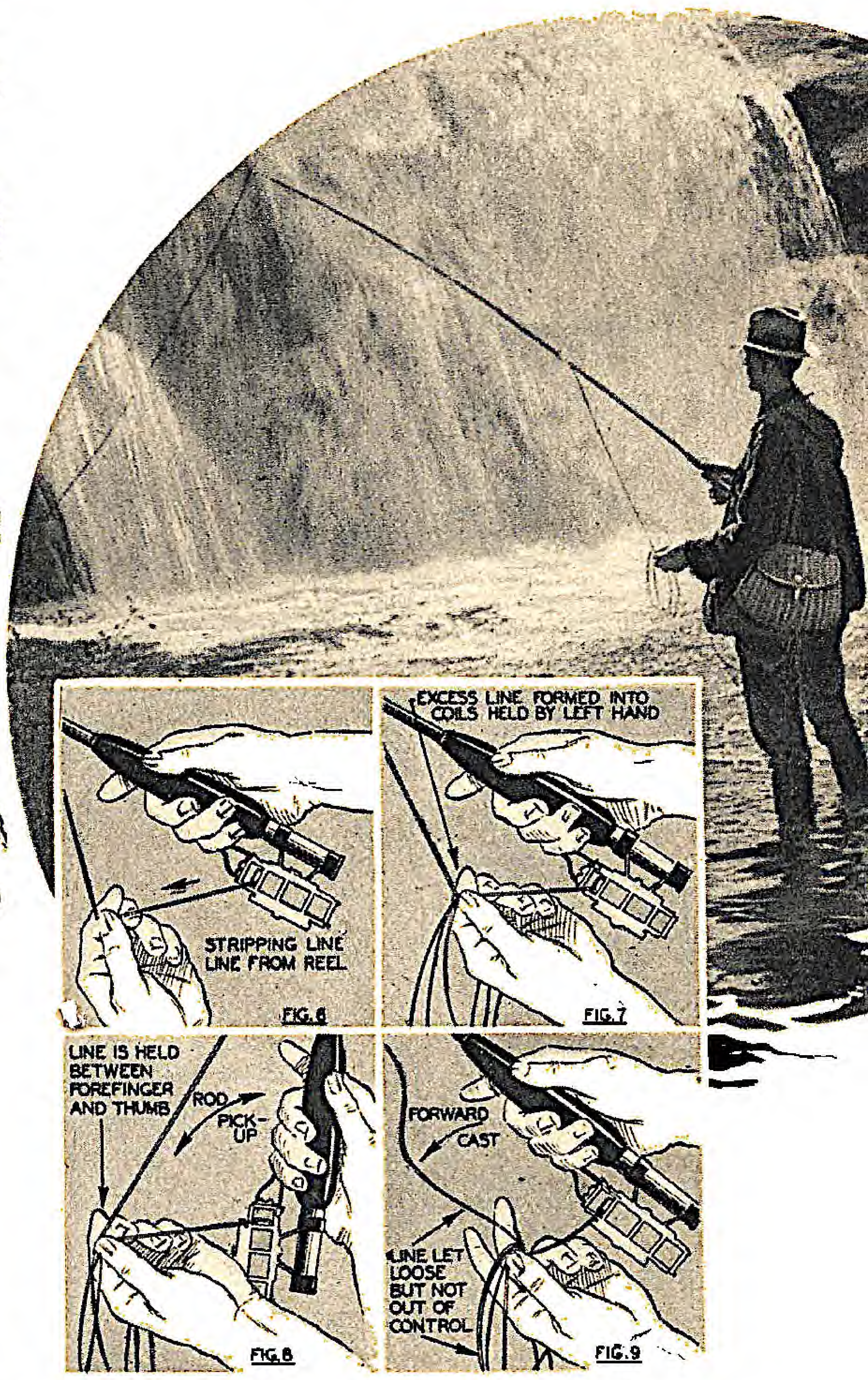
CAMPFIRE of FLY CASTING

by **ROBERT PAGE LINCOLN**

Hunting and Fishing Editor


PLACING THE FLY
FIG. 2
AIM TWO FEET ABOVE THE MARK, RAISE ROD TIP SLIGHTLY, DRAW ARM BACKWARD TO CHECK LINE AND DROP FLY TO THE WATER
PLAYING THE FLY
FIG. 3
TWITCH THE ROD TIP, GRADUALLY RAISING ROD AND WORKING IN LINE WITH LEFT HAND
STARTING THE BACK CAST
FIG. 4
LIFT ROD TO TAKE UP LINE SLACK THEN PULL BACK SHARPLY FOR BACK CAST
BACK CAST
FIG. 5
BRING ROD TO VERTICAL ALLOWING IT TO DROP PAST THAT POINT, COUNT TO FOUR, THEN PULL ROD FORWARD SHARPLY FOR FORWARD CAST

These illustrations show how the fly is placed and played on the water and how back cast is made. The danger of the back cast is bringing the rod too far back, the line losing its energy. The beginner should stop at vertical and let line swing back to half loop.


EXCESS LINE FORMED INTO COILS HELD BY LEFT HAND
STRIPPING LINE LINE FROM REEL
FIG. 6
FIG. 7
LINE IS HELD BETWEEN FOREFINGER AND THUMB
ROD PICK-UP
FIG. 8
FORWARD CAST
LINE LET LOOSE BUT NOT OUT OF CONTROL
FIG. 9

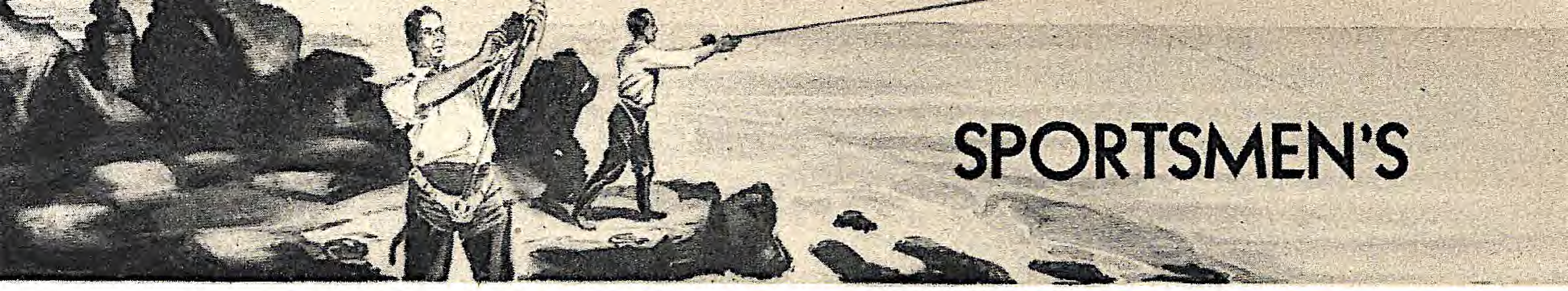
In photo above fisherman is playing the fly and is ready to start back cast. Note loops in left hand. Drawings show how line is stripped from reel and held in loops in left hand.

or two ahead of the cork handgrasp, which is correct. For the five-ounce rod, which is the weight of rod mostly in use in fly fishing, the reel, with line on it, must weigh 7½ ounces; the six-ounce rod (bass size) should take a 9-ounce reel, which, of course, also means including the line. The typical automatic fly fishing reel more nearly fills the bill than the single action reel.

Another important point is the necessity of using a line that is of the proper weight for the rod used. Generally the line selected is too light. Size E lines are about right for fly rods ranging 4 to 4½ ounces in weight. Rods 5 to 5½ ounces will easily carry a D line with good results in casting. Rods that range 5, 5½, 6 and 6½ ounces are best fitted with size C lines. Keep these weights of rods and calibers of lines well in mind, for just as sure as you use a light line on a stiff or comparatively heavy fly rod, just so sure will you be making a bungling start of it at fly casting.

Remember always that it is not the light fly at the leaders' end that you are casting. You are, in truth, casting a line; in fact, to be accurate, it should be called "line casting" instead of "fly casting." As your line is thrown back, the heft of it pulls the rod back and

[*Continued on page* 126]



SURF FISHING Lures Inland Anglers to Sea

Surf fishermen on a California beach sit with feet braced ready of any denizen of the deep to seize lure.

At top—The surf cast is made with both hands. Above—Battling a large fish. Note the butt rest for the rod. At left—Guitar fish caught in the Pacific surf.

by PAUL W. GARTNER

IN THE shifting troughs of sand below the never ending breakers of the sea swarm hungry denizens feeding upon bits of shell fish, sand crabs, and rock worms. These fish are the quarry of surf casting, a sport that is attracting many inland anglers to the seashore.

The southern Pacific offers the surf caster a large variety of fish. On warm moonlit nights giant tiger, leopard, and oil sharks can be caught. Their weight sometimes exceeds 200 pounds.

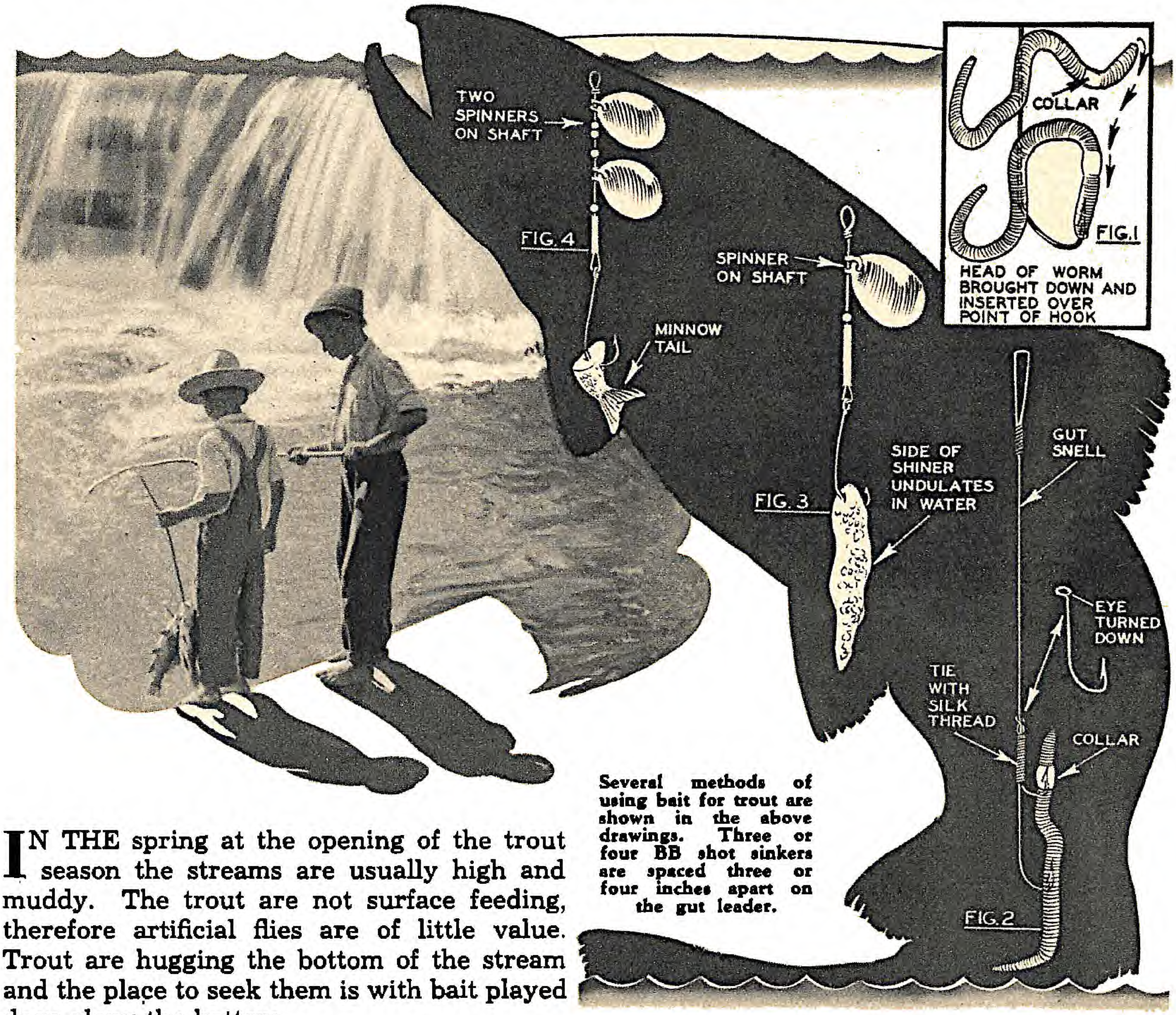
The man of average build should choose a rod which has a tip six or seven feet in length and between 12 and 14 ounces in weight. The butt of the surf rod has twin grips 21 to 26 inches apart.

Surf reels which spool between 200 and 300 yards of 12-strand line are usually sufficient, except for giant sharks when 400 yards of 15 or 18-strand line is desirable.

For the smaller surf fish a gut leader, testing from 15 to 25 pounds, is used with two or three hooks and a three to six-ounce sinker tied to the end. No. 4 or smaller hooks are adequate, but for sharks a hook about No. 6/0 on a six-foot steel strand leader is best.

In casting the angler grips his rod with both hands, his left side toward the sea, his rod pointed shoreward. Sharply the left hand pulls downward, the right hand giving the final impetus which hurls sinker to sea.

Tips on USING Effective BAIT for TROUT


TWO SPINNERS ON SHAFT
FIG. 4
MINNOW TAIL
SPINNER ON SHAFT
FIG. 3
SIDE OF SHINER UNDULATES IN WATER
COLLAR
FIG. 1
HEAD OF WORM BROUGHT DOWN AND INSERTED OVER POINT OF HOOK
GUT SNELL
EYE TURNED DOWN
TIE WITH SILK THREAD
COLLAR
FIG. 2

Several methods of using bait for trout are shown in the above drawings. Three or four BB shot sinkers are spaced three or four inches apart on the gut leader.

IN THE spring at the opening of the trout season the streams are usually high and muddy. The trout are not surface feeding, therefore artificial flies are of little value. Trout are hugging the bottom of the stream and the place to seek them is with bait played deep along the bottom.

Ninety per cent of the lures used in early spring trout fishing are angleworms. A gut leader about three feet long will do both for fly and bait fishing. For bait fishing space two or more shot, BB in size or larger, three or four inches apart on the leader.

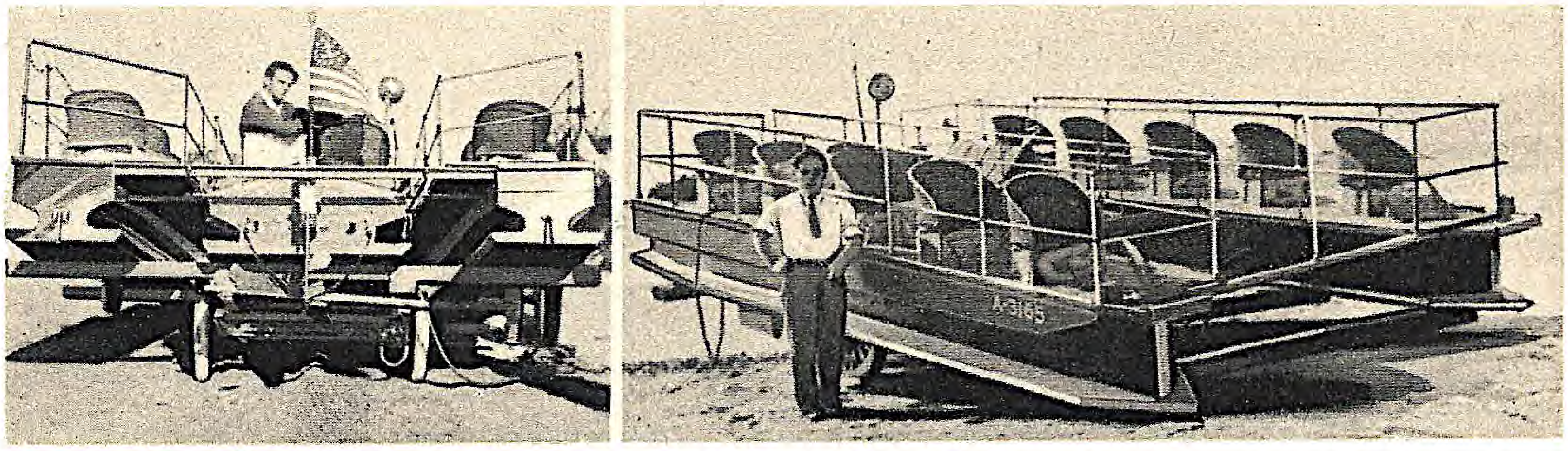
A method of attaching the worm to the hook is shown in Fig. 1. It tends to make the hook weedless. The worm is hooked on as shown, after which the head of the worm is pressed onto the point of the hook. Two worms can be used as shown.

Two hooks are fifty per cent more effective than one. As shown in Fig. 2, a snelled hook is used with a second hook with a turned down eye being slipped over the snell. It is tied tightly to the first hook with silk thread. The worm is then hooked on, its collar being pressed over the small hook.

A spinner-on-shaft combination, either single as shown in Fig. 3 or tandem in Fig. 4, is especially effective in muddy water. The lure in Fig. 3 is the side of a shiner, which being limber will have an undulating motion in the water.

The lure in Fig. 4 is a minnow tail, cut with some of the tail section left on and hooked as shown. This is excellent lure for large rainbow and brown trout.

Pontoons Convert Speed Boat Into Novel Pleasure Craft

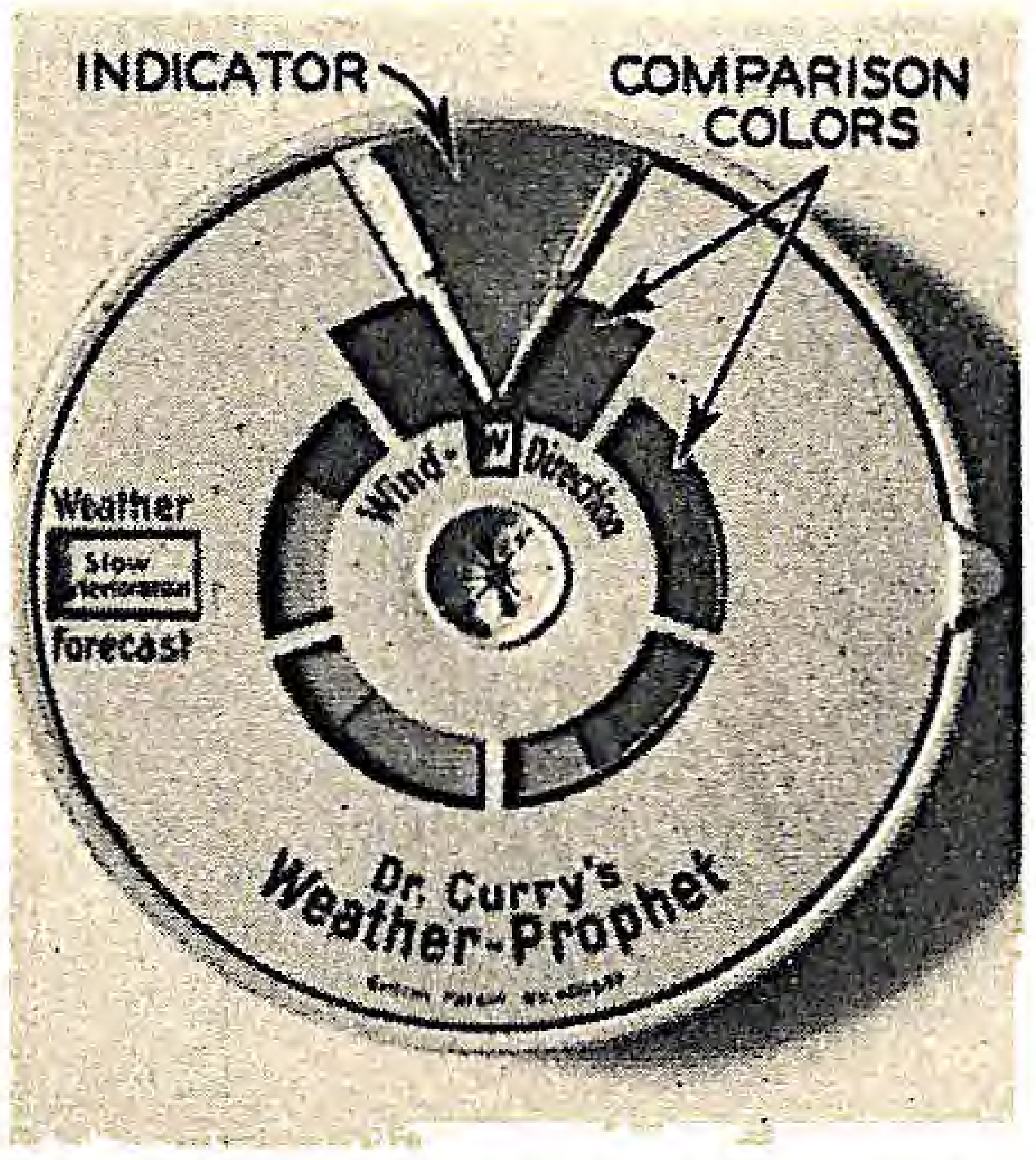


Left—Rear view of newly-built pontoon speed boat. Note the anti-wave-splash grooves which, dipping downward, tend to buoy up the stern. Right—Chairs for passengers are placed atop the framework into which the power unit nests.

SANDWICHED between two large pontoons, a small speed boat, equipped with a Ford V-8 motor, is capable of carrying pleasure seekers over the waves at a speed of 65 miles per hour. Twelve passengers, including the pilot, can be seated comfortably in two rows of chairs which are mounted over each pontoon and surrounded by guard rails for complete safety.

Horizontal grooves cut deep in the sides of the pontoons and motor boat help to eliminate side-splash. This odd-looking craft, which is twenty feet long and ten feet wide, weighs approximately 1,600 pounds. The inventor states that with his pontoon speed boat he averages seven miles to the gallon.

Weather Forecaster Fits Pocket

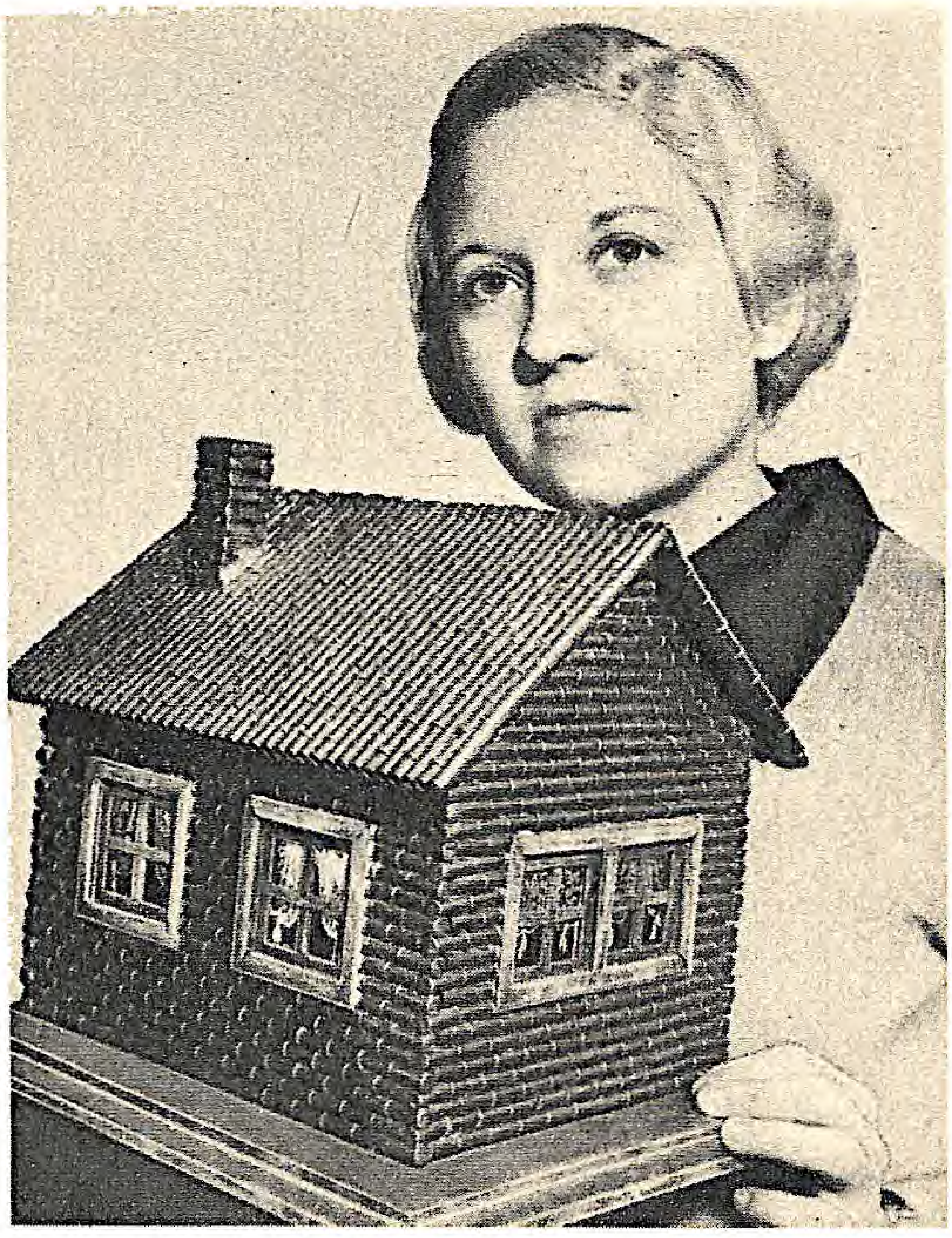


Sunshine or rain? Handy portable prophet shows weather at a glance.

OUTDOORSMEN now may forecast tomorrow's weather with a handy pocket-size device which is being marketed by an English inventor. Believed to be superior to the barometer, the new instrument considers the direction of the wind when making predictions. A chemical indicator reveals the degree of moisture in the air by changing its color. Blue, for instance, means slight humidity or dry fine weather, while bright red denotes great humidity and a period of storminess. If not exposed to the direct rays of the sun, the chemical indicator lasts indefinitely.

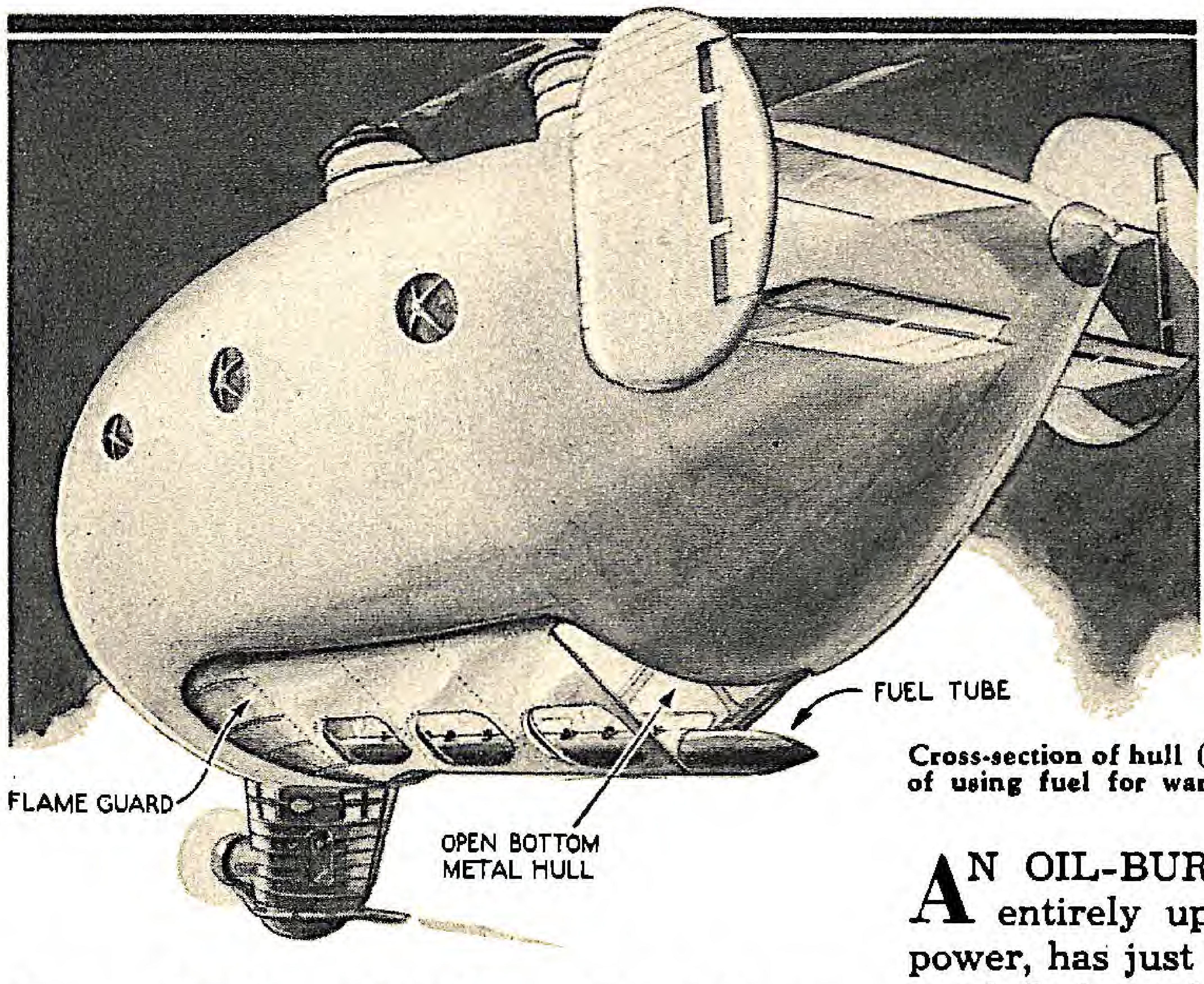
Model Home Made of Empty Shells

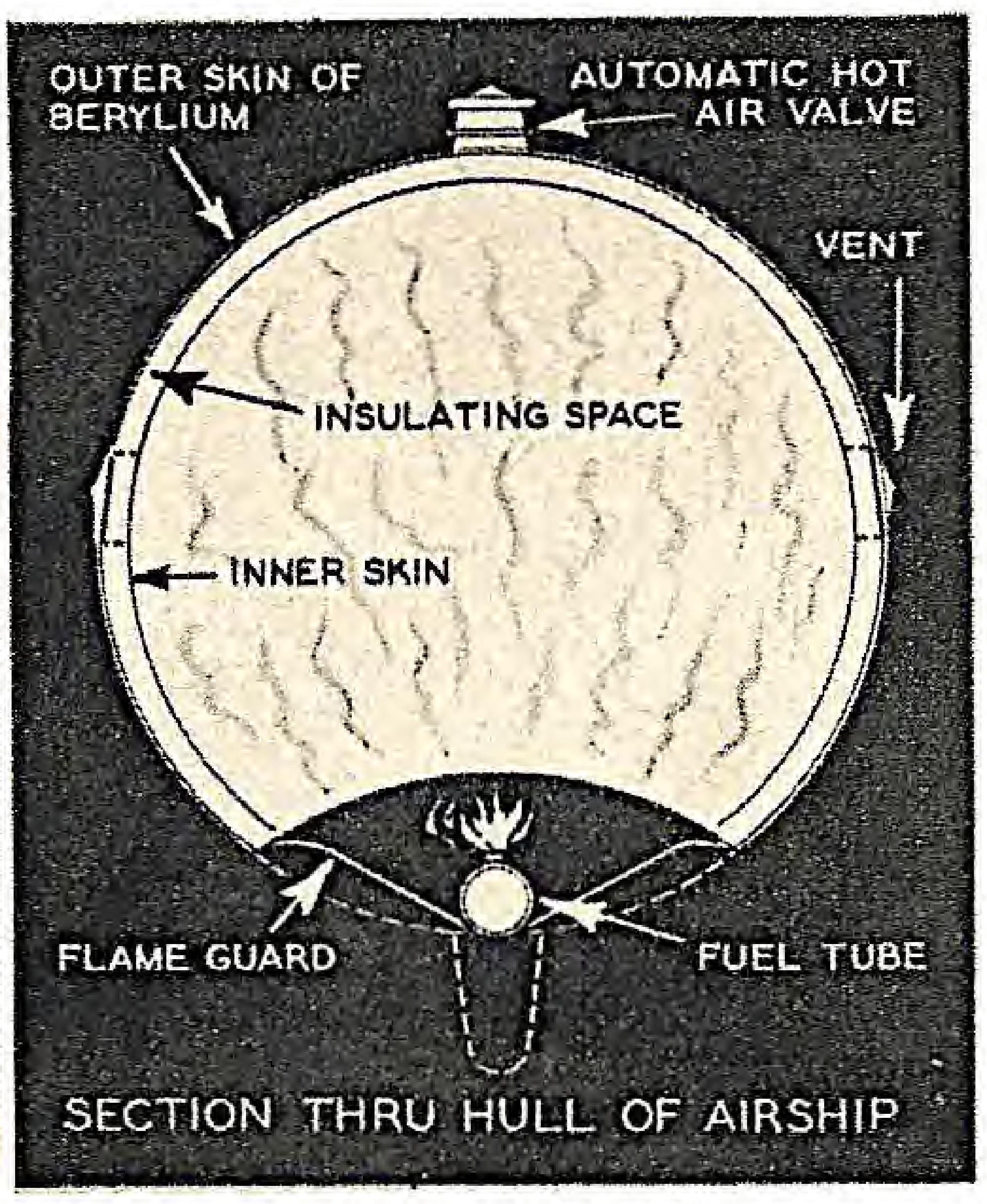
WORKSHOP fans who are looking for new miniatures to construct should try duplicating this model home which was built entirely from empty revolver shells. The house is fifteen shells long and ten shells wide. Laid end to end and crisscrossing log-fashion at each corner, they are employed even in the chimney and tile-like roof. More than 2,000 cartridges were needed to fashion the unusual model which was featured at a national hobby exhibition which was held recently in Chicago.



Empty cartridges were used in place of lumber in constructing this rustic-looking cabin. Note the unusual log effect.

Hot Air Lifts New German Dirigible



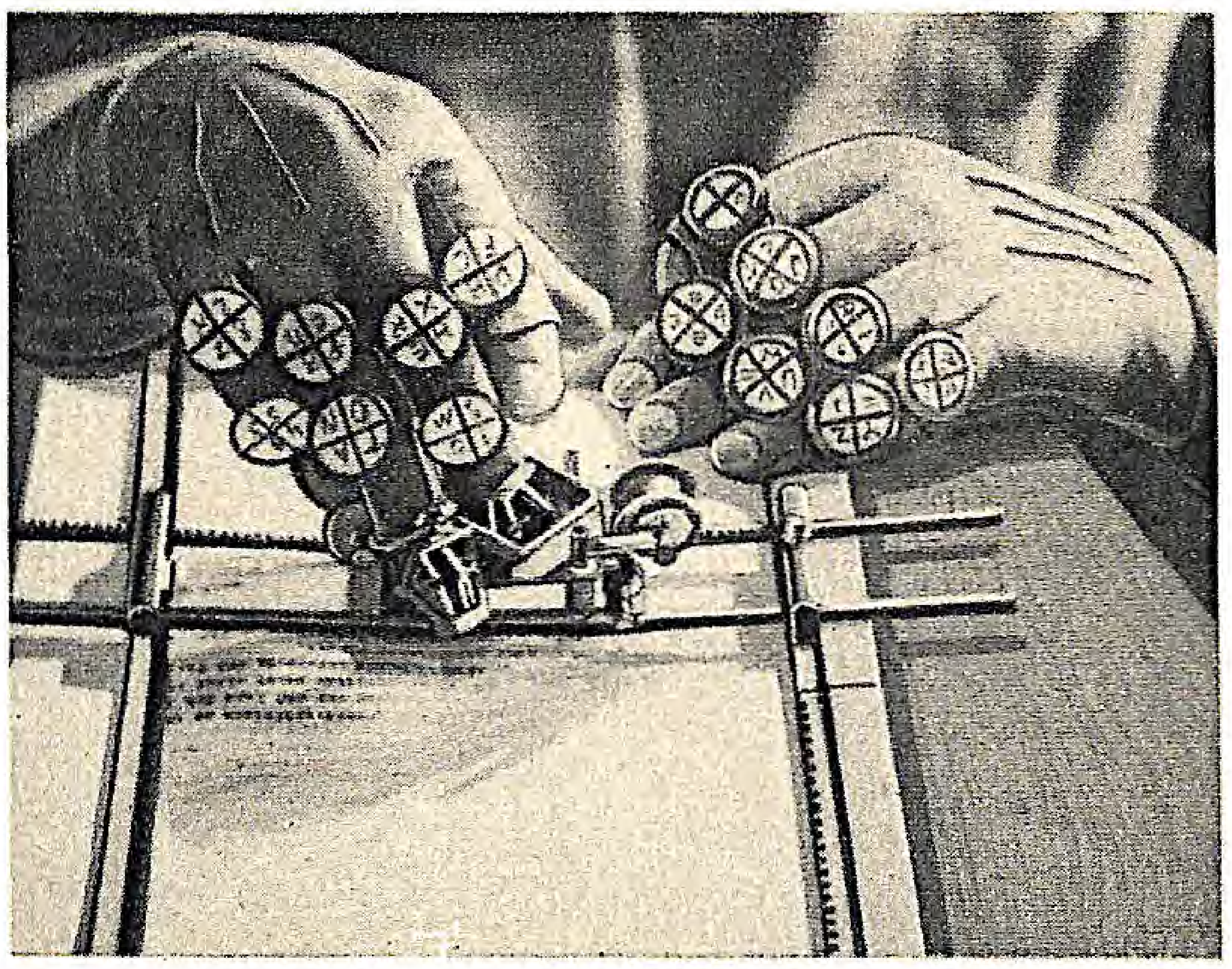


Hot air furnishes the lifting power for this newly-designed dirigible. Cross-section of hull (above) reveals inventor's unique method of using fuel for warming the inside area of the giant bag.

Type Keyboard Worn On Fingers

A MINIATURE typewriter, novel because the keyboard characters are attached to a pair of gloves, was recently invented by a Tyrolian merchant.

The apparatus, which threatens to revolutionize the present office typewriter, consists of two parallel rails between which are mounted a small carriage, a typewriter ribbon and an automatic spacer. To operate the device, the typist merely presses the single characters on the fingers through an opening in the carriage to the ribbon, thus recording the message on paper.



Radical in design, this "kid-glove" typewriter has its many character signs fastened to the fingers of the operator.

AN OIL-BURNING balloon, which relies entirely upon heated air for its lifting power, has just been devised and tested successfully in model form by a German inventor.

Employing the same idea found in the earliest straw-burning, lighter-than-air craft, the new dirigible obtains a constant supply of hot air from numerous oil-fed flame jets suspended beneath the open bag. Aluminum deflectors protect the flames against the wind and air-screw slip-stream, while constant pressure within the metal bag is maintained by side vents and automatic valves set in the top. Ascent and descent are controlled by regulating the size of the flames. The cabin houses a gasoline motor to drive the propellor that pulls the ship. Descent is made possible by opening the automatic hot air valve which is located in the top.

Tiny Mirror Tests Egg Quality

THE quality of eggs can be determined at a glance with this novel, foreign-made device. When the egg is placed atop an egg cup, a tiny mirror built into the darkened base reflects the translucency of the specimen.

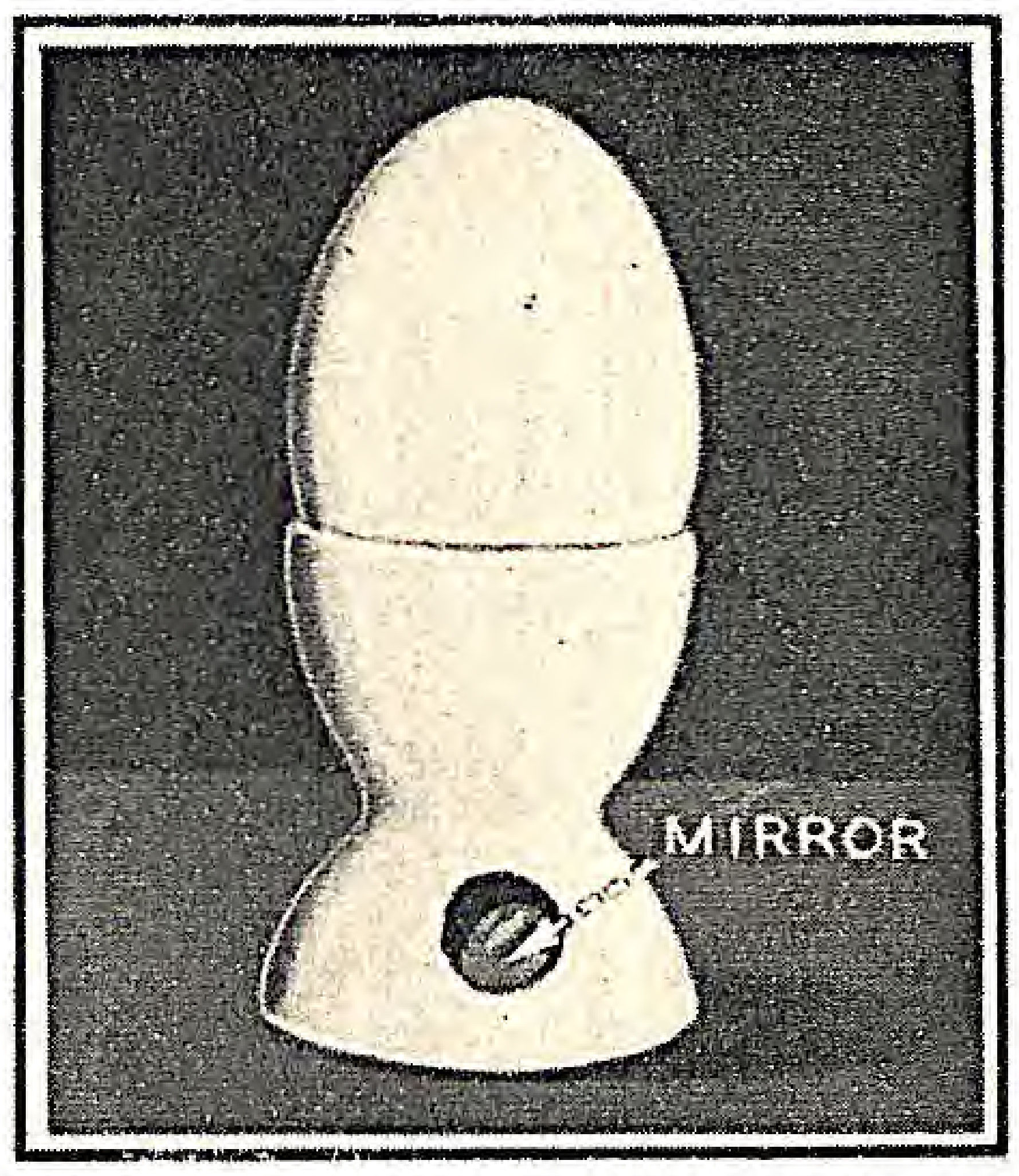
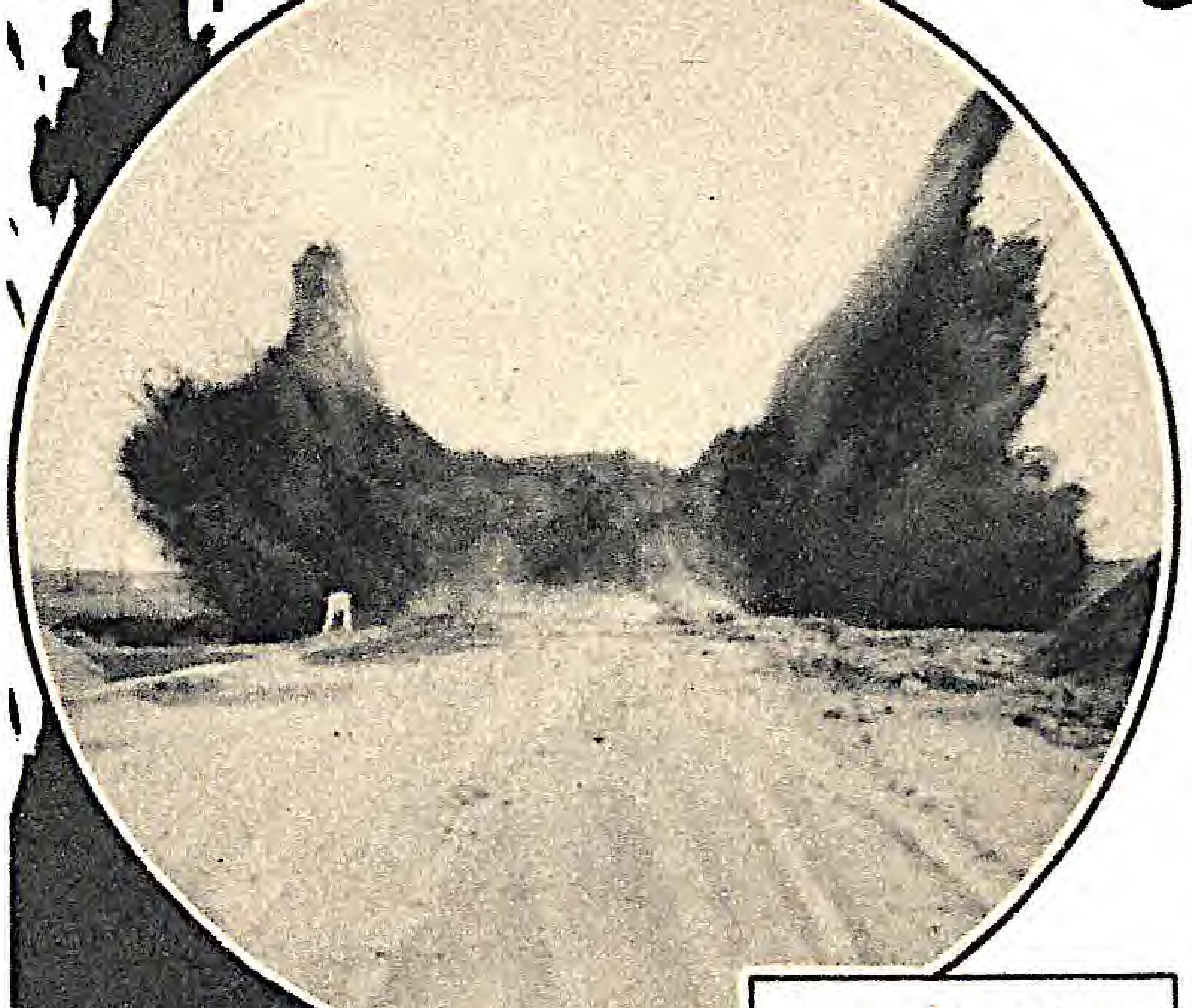


Image in egg cup mirror detects bad eggs without artificial light.

BLASTING *Roads through Treacherous* SWAMPS



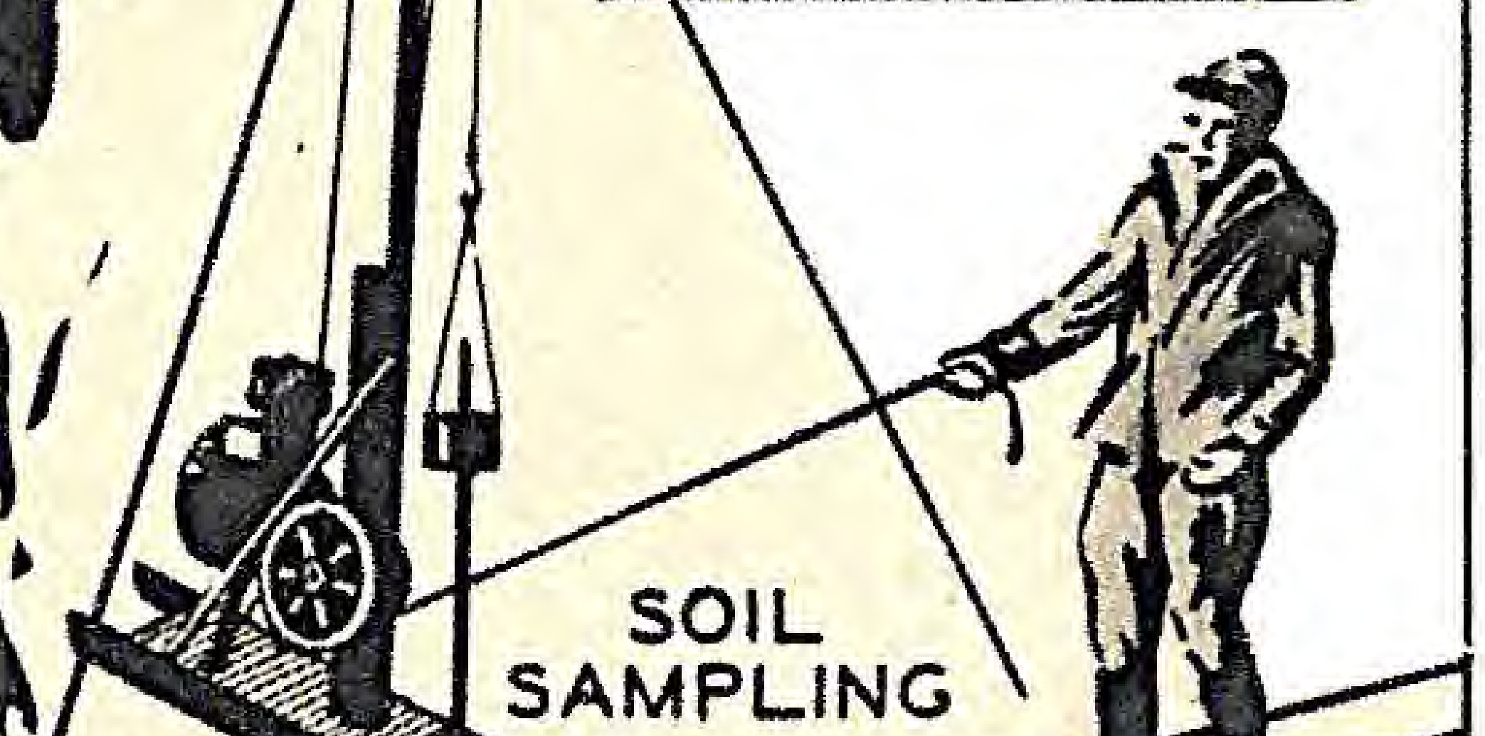
Above—A billowing mushroom of muck shoots skyward as a dynamite blast clears the way through a swamp for a clay and gravel fill. Below — A comparison of Minnesota and New Jersey swamp blasting methods.

A LOUD roar re-echoes over the swamp. Splattering towers of mud shoot skyward, and solid layers of sand shift downward to the solid bottom beneath the muck. Slowly but surely a straight line of clay and gravel fill is stretching across the marshy lowlands to provide a firm foundation for the highway that is to follow.

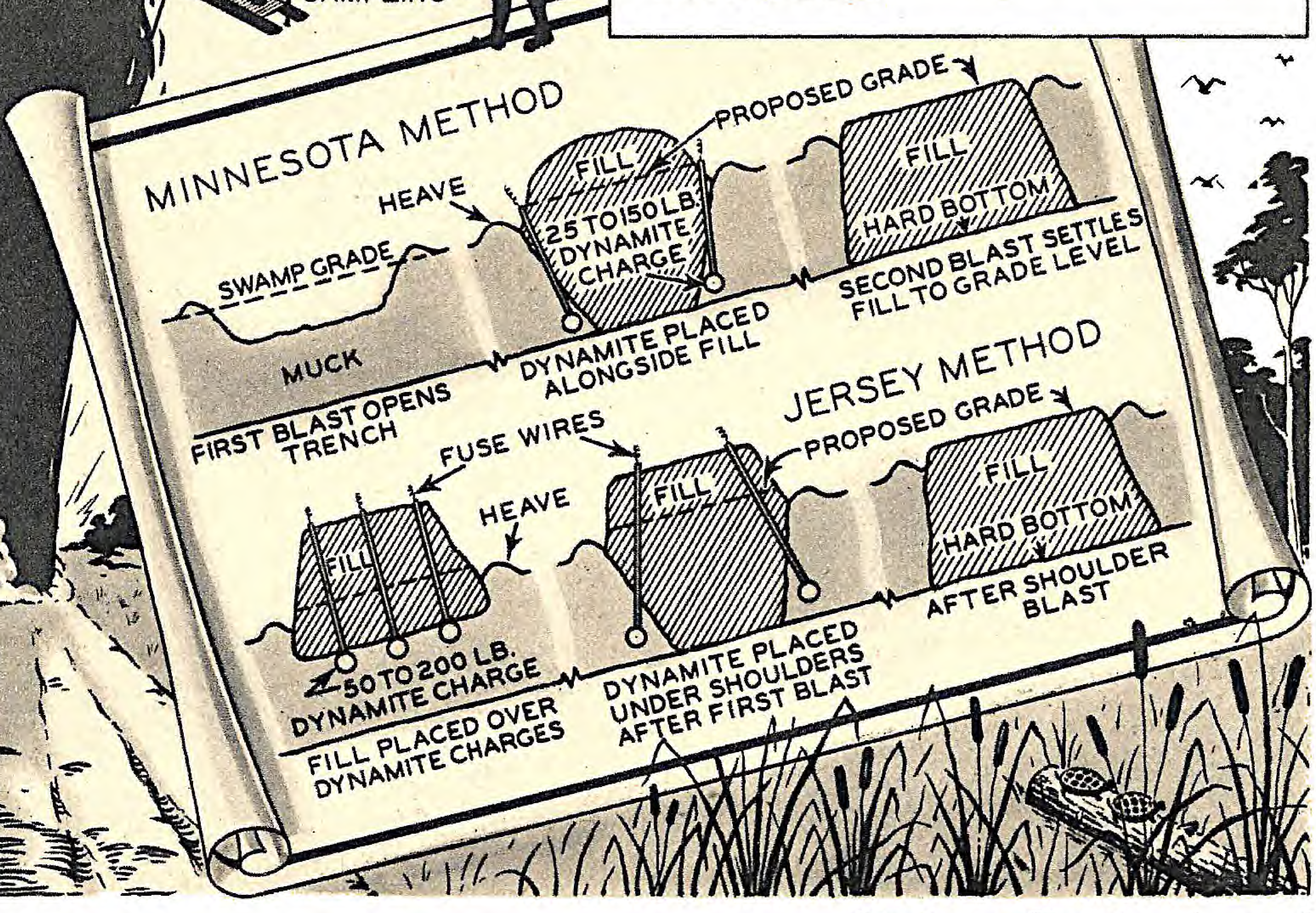
Dynamite blasting now permits engineers to lay a solid foundation for a road across treacherous swamps. There are two methods used—the Minnesota and New Jersey methods.

Using the Minnesota system, a shallow trench is blasted through the marsh. In this the fill is placed and dynamite charges set on each side of the fill. The dynamite is exploded, its force going downward, pushing away the muck and allowing the fill to settle under its own weight. In the New Jersey system, boxes of dynamite are placed on the surface where they are weighted down by the fill. When the charge is set off, it displaces the muck underneath and the fill settles to the bottom.

In either method, when the fill does not completely settle, it is necessary to "shoulder blast." Charges are set at strategic points under the shoulder to blow away the intervening mud to provide room for the upper ballast which sinks to form a perfect road foundation.



SOIL
SAMPLING



MINNESOTA METHOD
HEAVE
SWAMP GRADE
MUCK
FIRST BLAST OPENS TRENCH
FILL
25 TO 150 LB. DYNAMITE CHARGE
DYNAMITE PLACED ALONGSIDE FILL
PROPOSED GRADE
FILL
HARD BOTTOM
SECOND BLAST SETTLES FILL TO GRADE LEVEL
JERSEY METHOD
FUSE WIRES
HEAVE
FILL
50 TO 200 LB. DYNAMITE CHARGE
FILL PLACED OVER DYNAMITE CHARGES
FILL
DYNAMITE PLACED UNDER SHOULDERS AFTER FIRST BLAST
PROPOSED GRADE
FILL
HARD BOTTOM
AFTER SHOULDER BLAST

Device Allows Lost Plane to Use Radio Stations As Beacons

Left—As experimental proof, Lear has mounted his device on an automobile. The loop aerial on the roof picks up the impulses, and the straight aerial in the rear acts as a pointer, to make sure the plane will travel toward rather than away from guiding station. Above—The guiding set is shown installed in auto. It weighs about 30 pounds and is equipped with a dynamotor which supplies power.

LOST in a storm, battling helplessly above the clouds, many plane pilots have been forced to make landings not knowing whether water, forest, or level land lay beneath them.

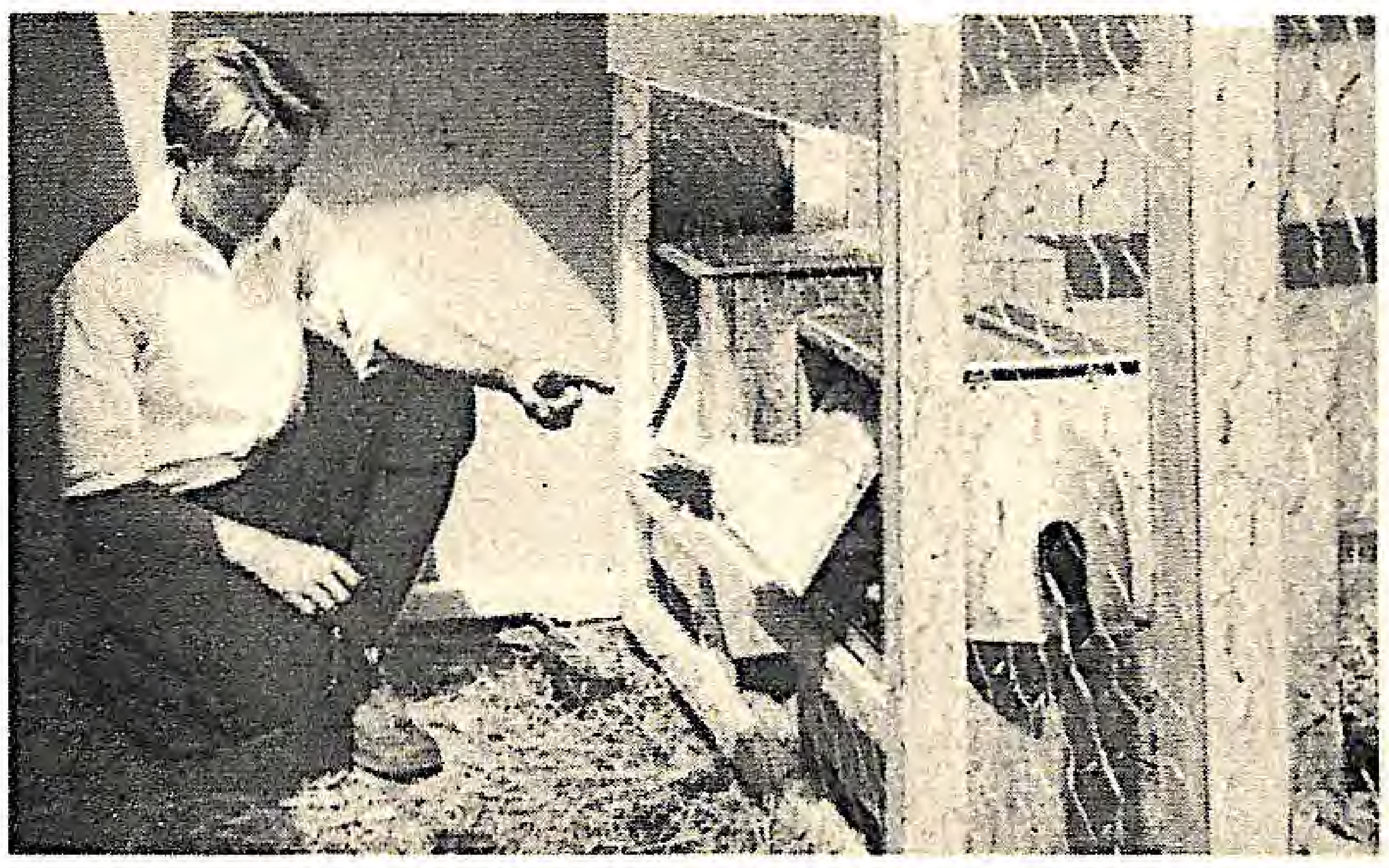
William Lear, a New York pilot, has invented a light inexpensive device which he believes will eliminate blind flying due to lack of visibility—a device which permits a pilot to use any radio station within range as a guiding beacon.

A loop aerial to be set in front of the plane is designed to pick up the signals; an upright aerial on the rear acts as a pointer to prevent the pilot from getting a signal 180 degrees out of phase.

Ingenious Box Separates Poultry

IN AN effort to separate their laying hens from the slackers or non-laying hens, three California men have invented a poultry separator.

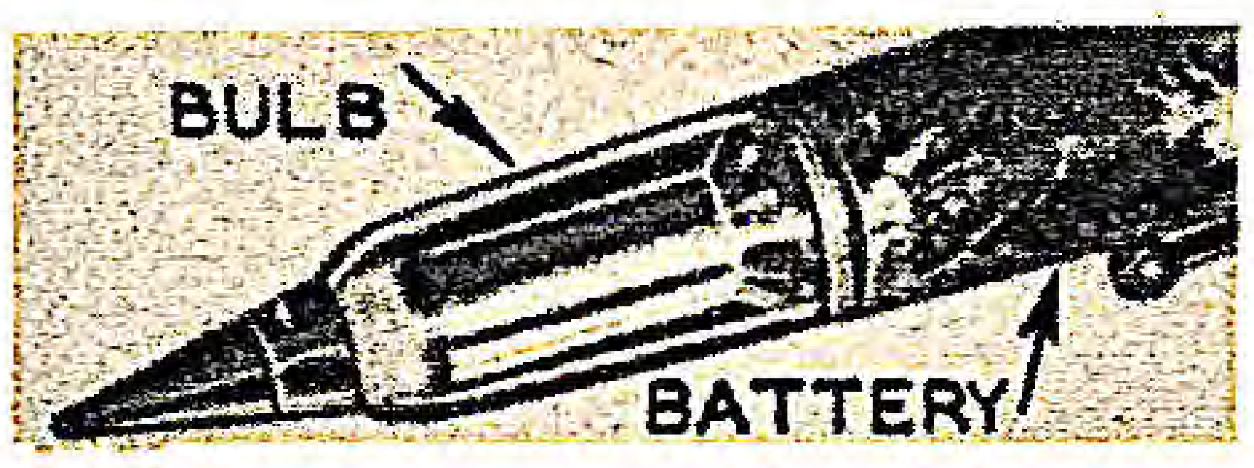
The hen enters a galvanized metal box and trips a door-closing lever. If the hen lays an egg, it drops down a channel and automatically locks all exits except the one leading to the yard set aside for laying hens only. If the hen fails to lay an egg, she can leave only by the exit leading to the non-layers yard.



As hen enters the above box, she automatically closes entrance. Only by laying an egg can she enter "layer's" yard.

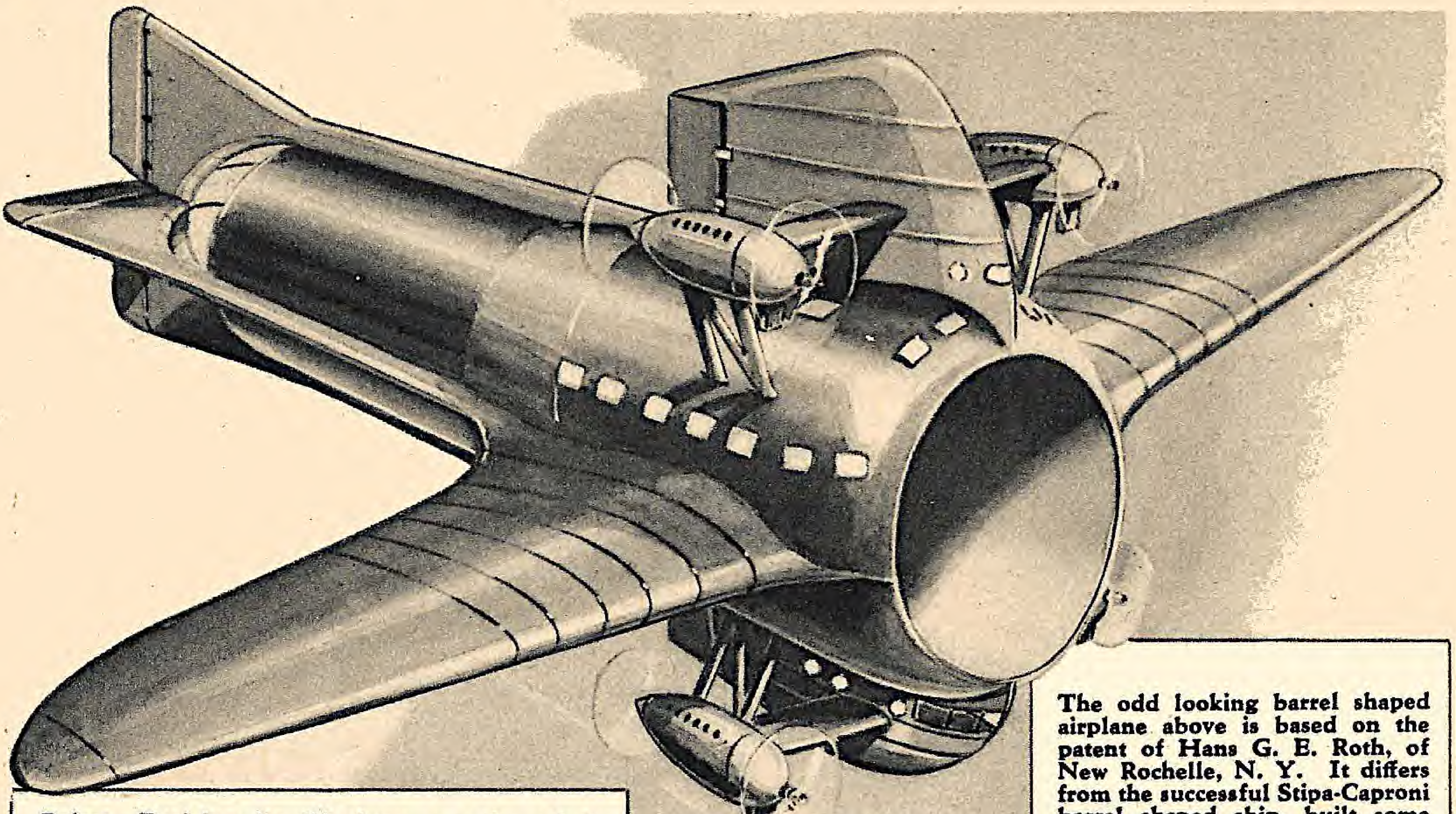
Pencil Lights For Night Writing

A NEW pencil, equipped with small flashlight batteries, can be illuminated by a turn of the handle for writing at night. The filament bulb is contained in a glass tube just above the pencil point. Unscrewing the point, the pencil can be used as a flashlight.



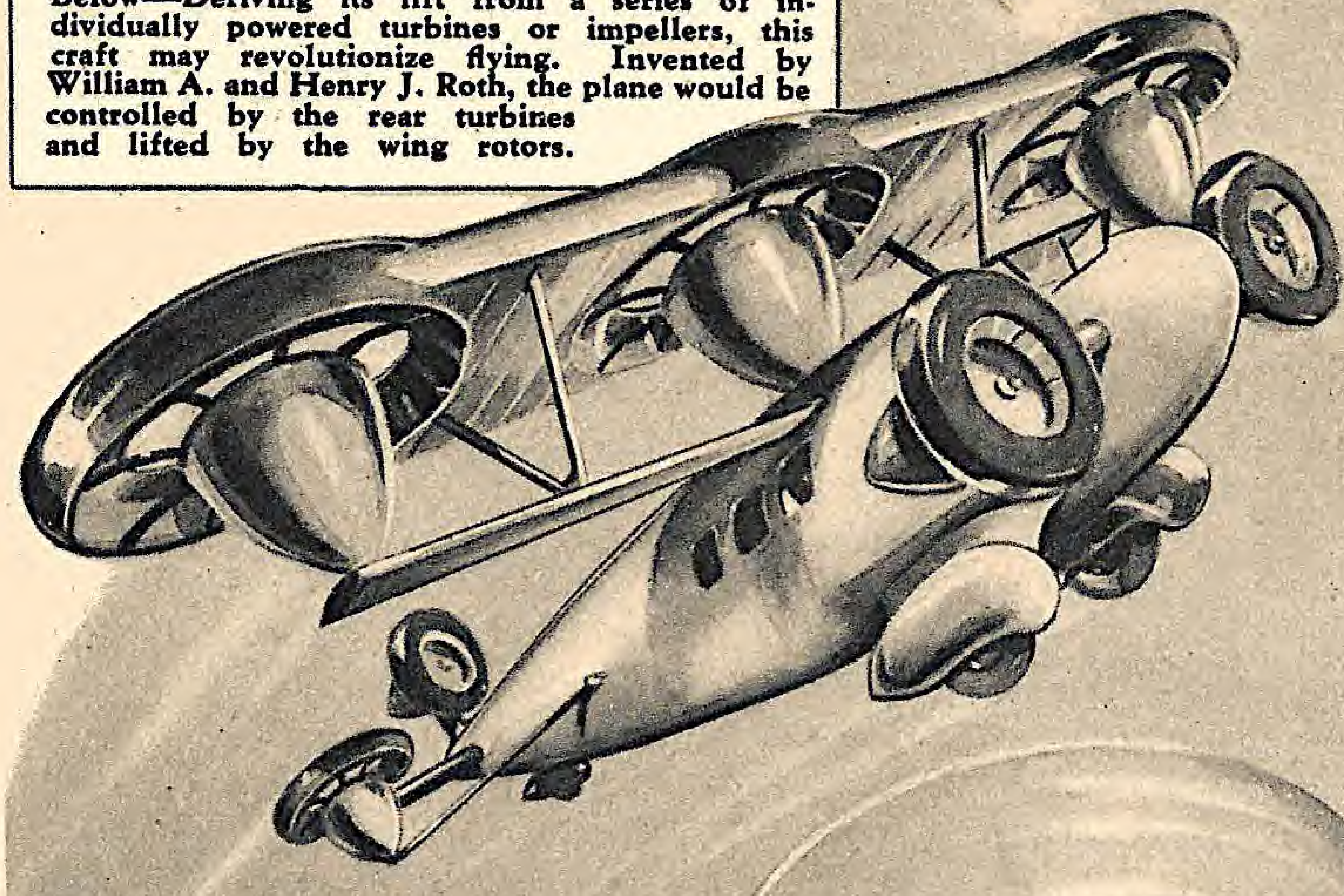
A very small bulb, located just above the point of the pencil, can be illumined for night writing.

Inventors Patent Odd Designs

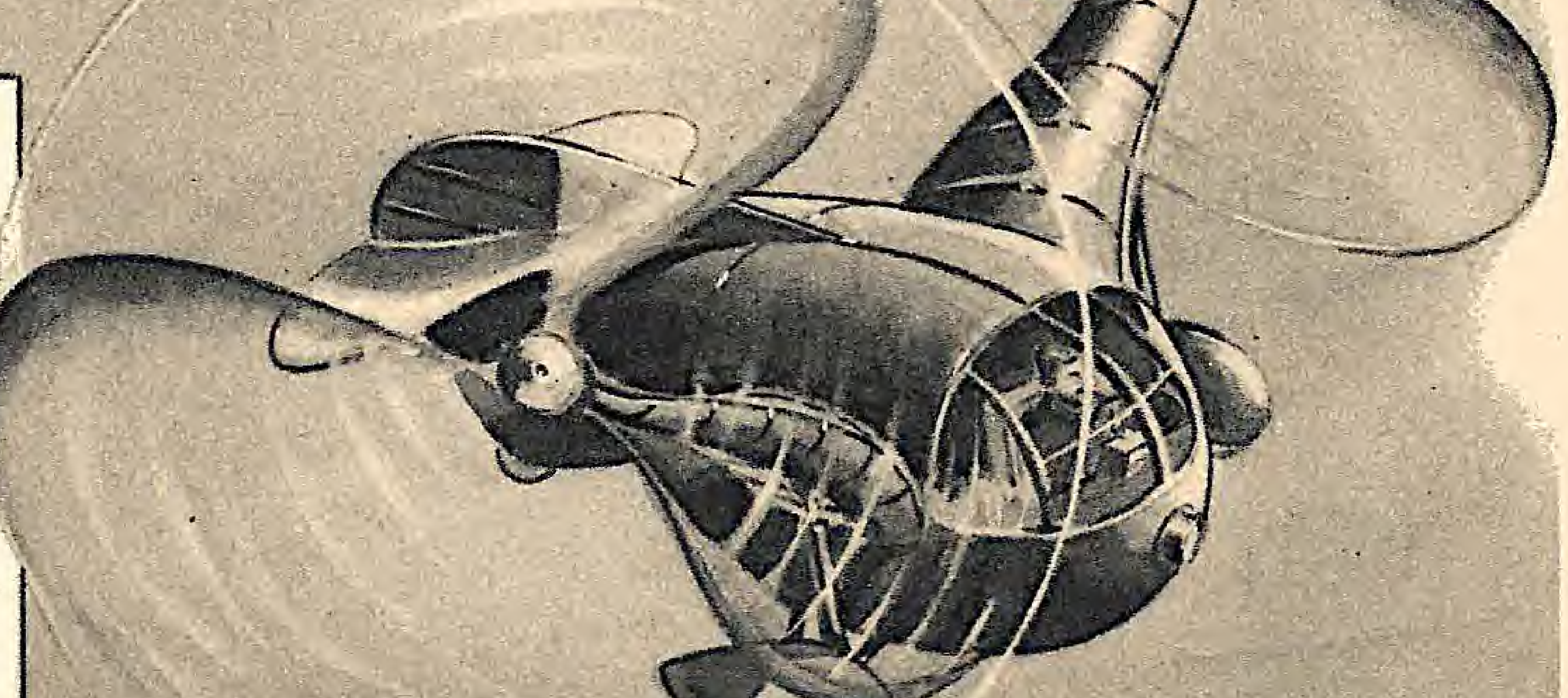


The odd looking barrel shaped airplane above is based on the patent of Hans G. E. Roth, of New Rochelle, N. Y. It differs from the successful Stipa-Caproni barrel shaped ship, built some time ago in Italy, in that the propellers are not mounted within the tunnel itself and in the curious arrangement of vertical fins above and below the main wing. These fins aid in lateral and directional control. Passenger accommodations would probably be located in the thickened portion of the barrel about the main wing, while the crew would be in the lower fin as shown above.

Below—Deriving its lift from a series of individually powered turbines or impellers, this craft may revolutionize flying. Invented by William A. and Henry J. Roth, the plane would be controlled by the rear turbines and lifted by the wing rotors.



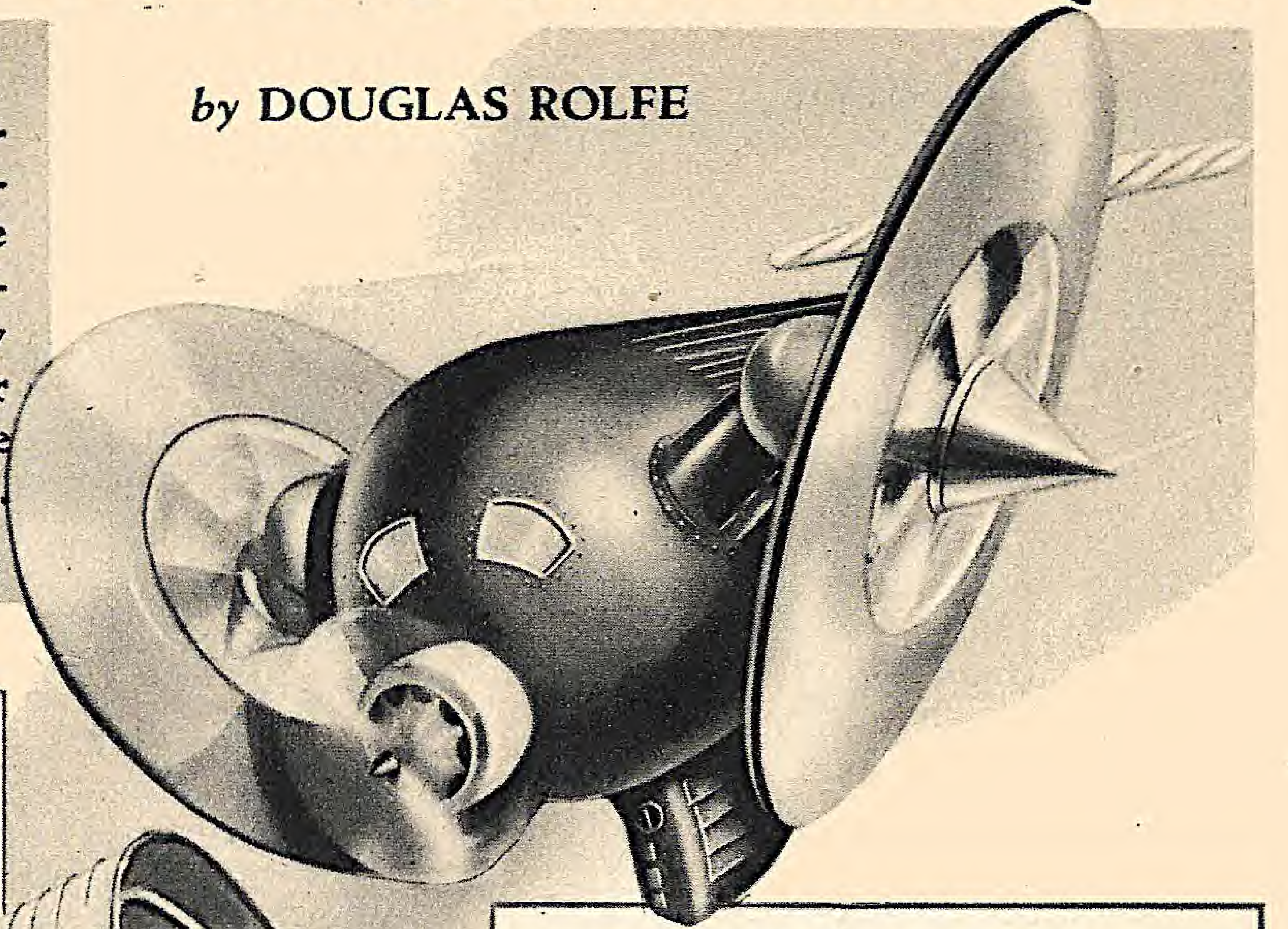
The flying machine at right was patented by Russell S. Powell, of Takoma Park, Md. It is an attempt to solve the problem of direct lift without the use of wings to support the ship in the air. The two 3-bladed propellers are intended to provide both lift and forward movement. They are set normally at angles so that the force of the screws are directed downward and to the rear. Such an airplane would not require wings to lift it. While ships of this general type have proved they are able to exert sufficient lift, a means of maintaining stability has yet to be discovered. This is the difficulty Cierva battled for years before finally meeting spectacular success with his Autogiro.



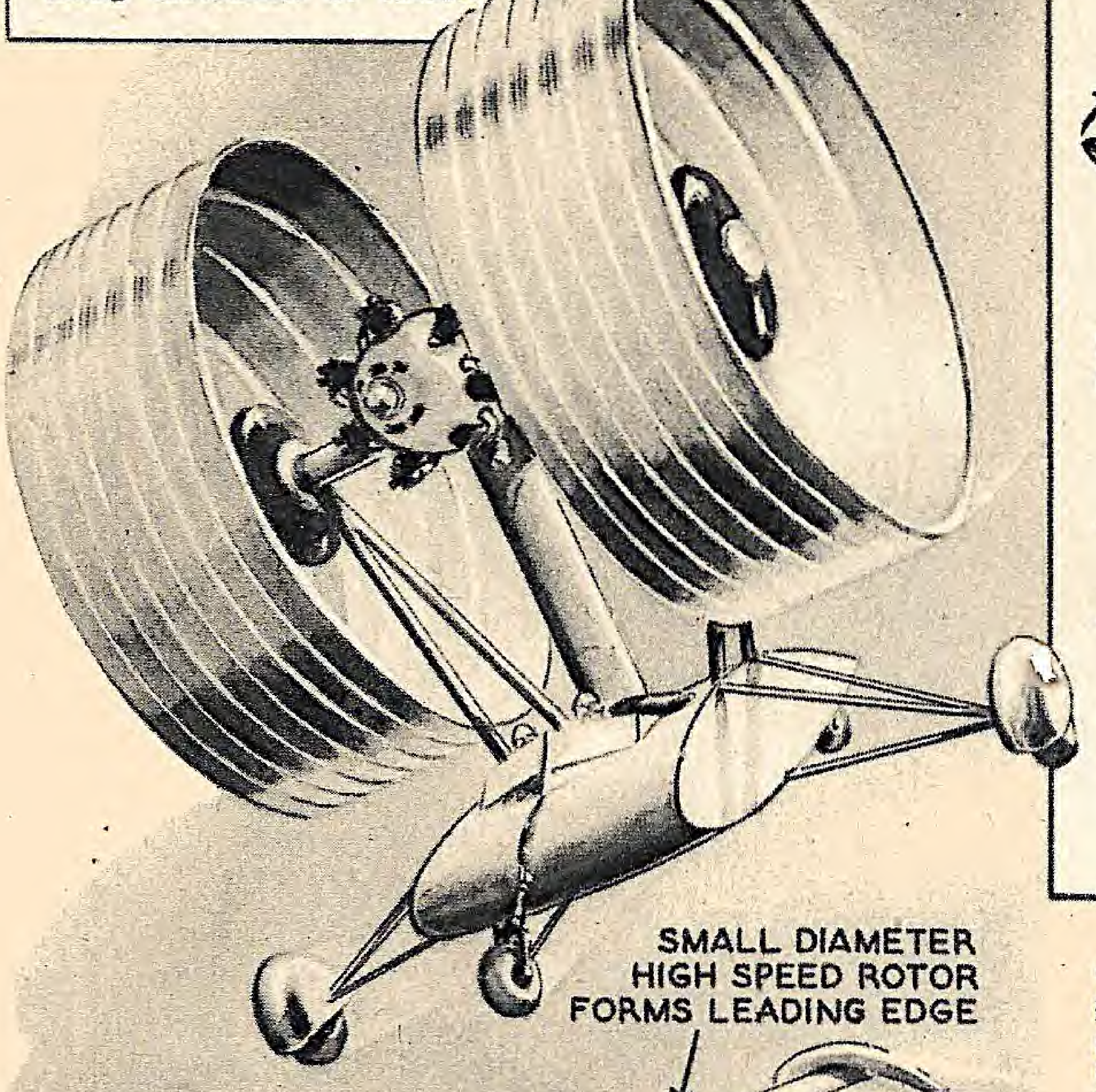
FOR SAFER AIRPLANES

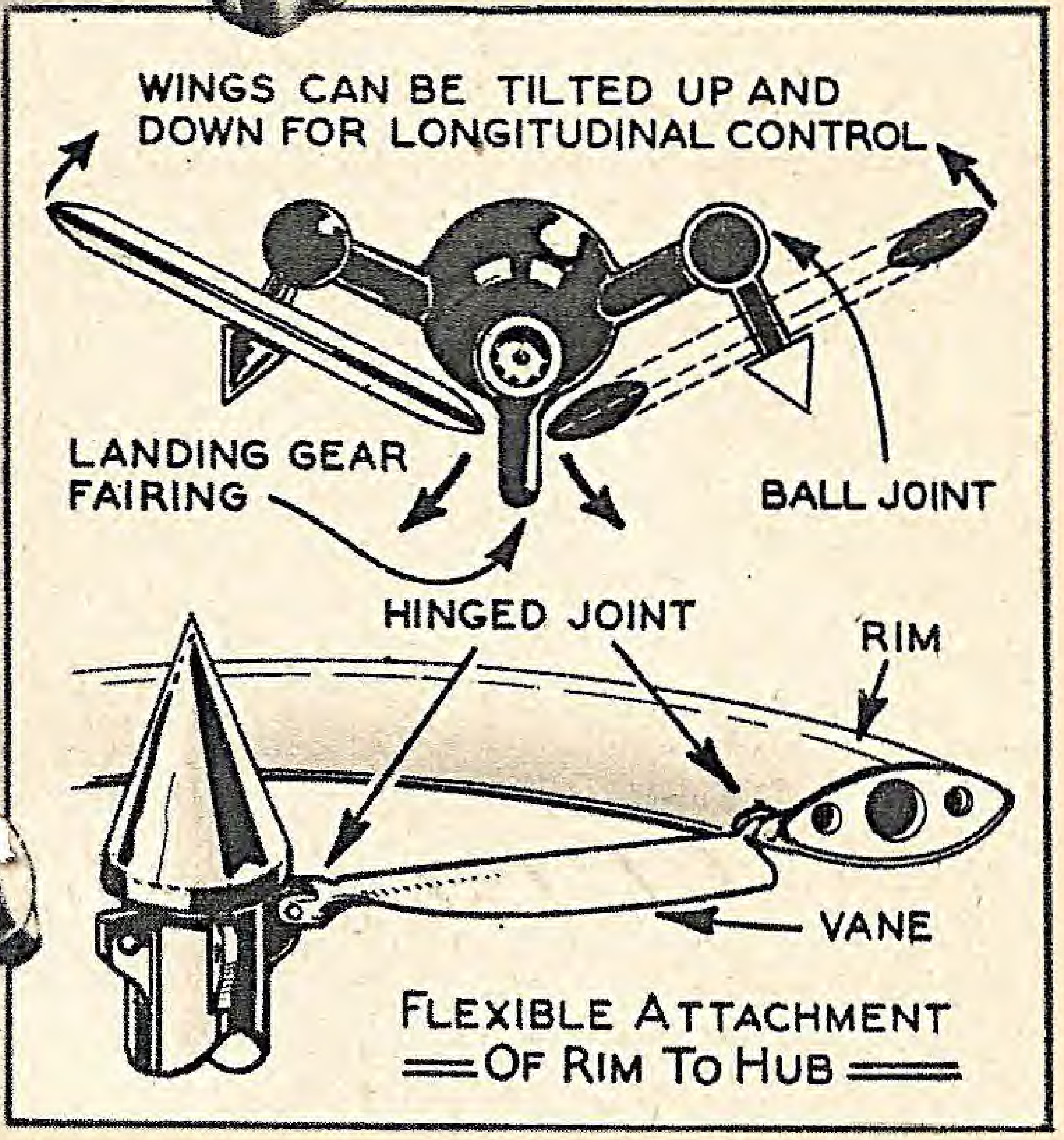
by **DOUGLAS ROLFE**

Unusual ships, straying away from accepted designs, are being tried in an effort to increase safety and simplify air travel. Some of the ideas are shown here.

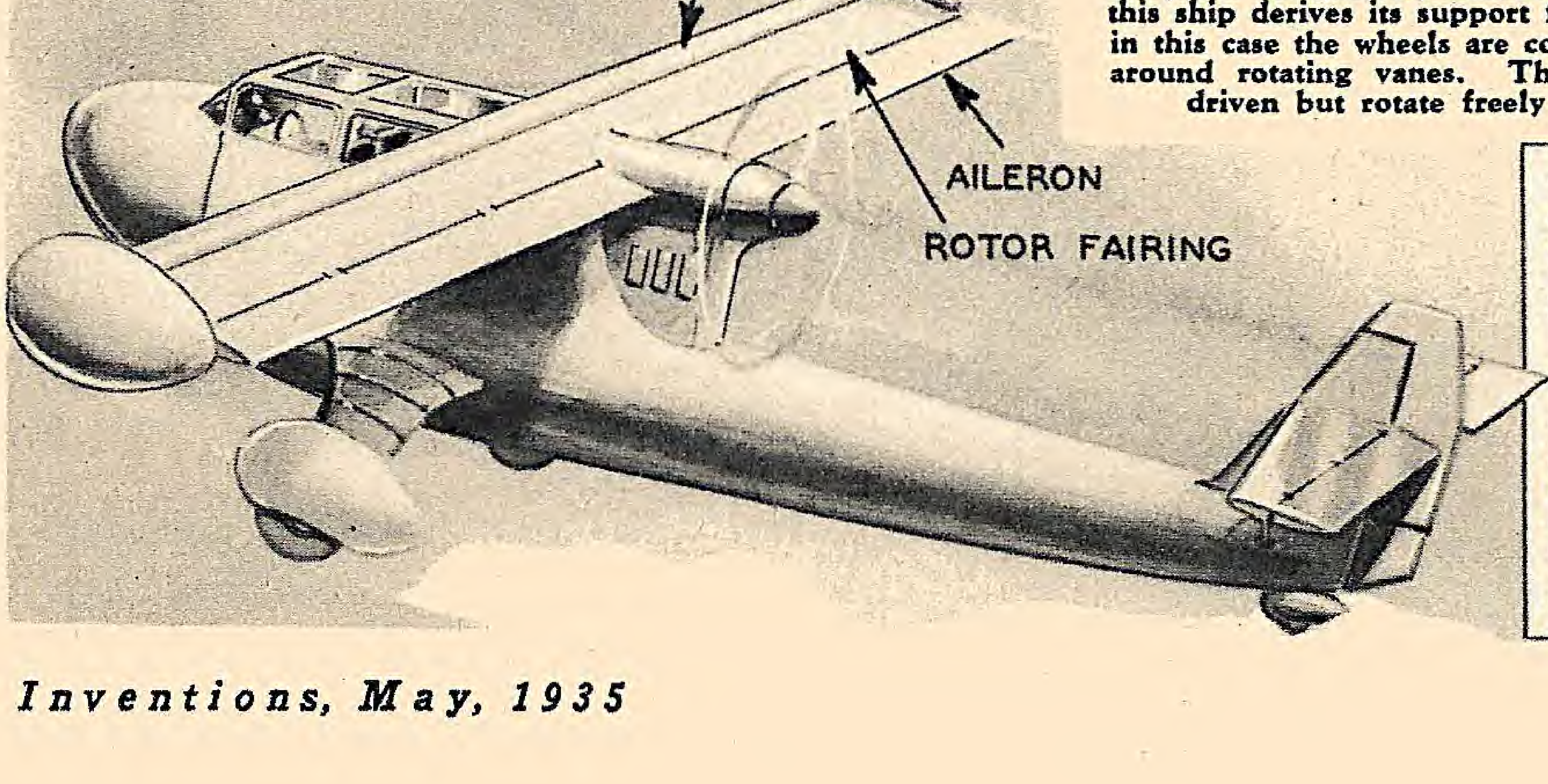


The remarkable "sidewheeler" below has actually undergone tests in France. The spinning rotors supplant usual wings. They both lift and propel the craft. Lateral stability is provided by rotating movement of rotors.



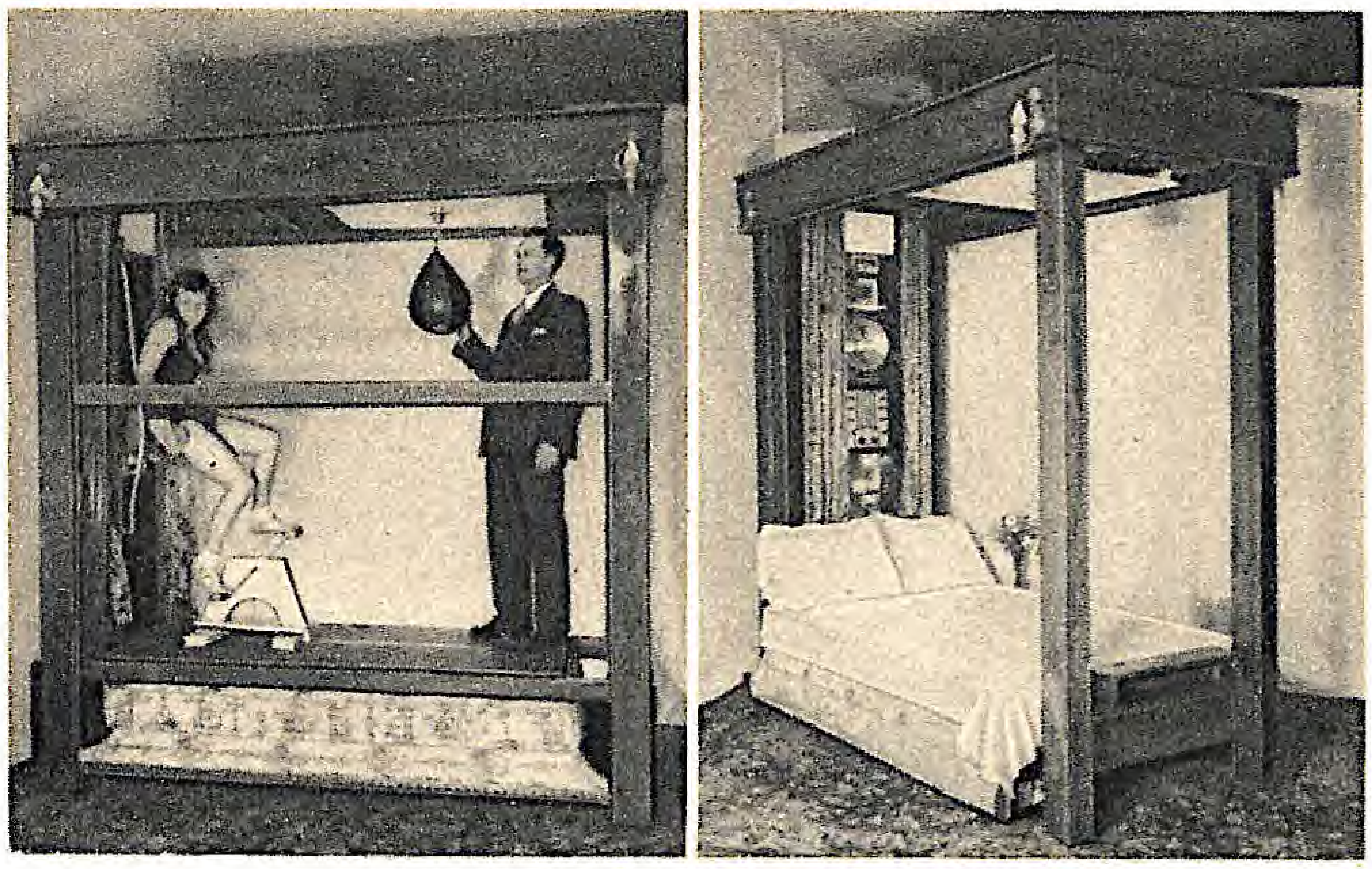

WINGS CAN BE TILTED UP AND DOWN FOR LONGITUDINAL CONTROL
LANDING GEAR FAIRING
BALL JOINT
HINGED JOINT
RIM
VANE
FLEXIBLE ATTACHMENT OF RIM TO HUB

The "Spinning Top" plane, illustrated in the drawings above, is the latest idea for the application of the paddle wheel theory now being tested abroad. Like the plane designed by Carl Strandgren (at left above), this ship derives its support from rotating wheels but in this case the wheels are composed of an outer rim around rotating vanes. The vanes are not power driven but rotate freely as in the autogiro.


SMALL DIAMETER HIGH SPEED ROTOR FORMS LEADING EDGE
AILERON
ROTOR FAIRING

The ship at left, designed by Alexander Chessin and Serge Trey, is intended to improve safe flying. A 12-inch hollow cylinder, 23 feet long forms the leading edge of the wing. Built on the Flettner rotor principle, it rotates 7,000 r.p.m. A constant stream of air is directed onto the cylinder by tiny jets to insure continuous lift.

Trapeze, Shower Bath, Punching Bag Feature Gym Bed



Left—Photo shows the gymnasium bed ready for exercise. Floor is placed above mattress. Right—Before conversion, bed has a conventional appearance. Radio, books and reading light are on shelves above head.

A COMPLETELY equipped gymnasium, a turkish bath, a shower bath—all these have been combined into a single colonial-style bed by J. S. Embree, Los Angeles inventor.

The bed is a "four-poster" with an awning top. Parallel bars are set between the end posts, and they are removable to be used across the top of the bed as trapezes. A punching bag-hook hangs from the top for arm and torso exercise; using a suspended swing as a seat, a small portable pedaling device furnishes exercise for the legs.

A shower attachment permits either a shower or a turkish bath after exercise. Music to accompany exercises comes from a radio set in the head of the bed.

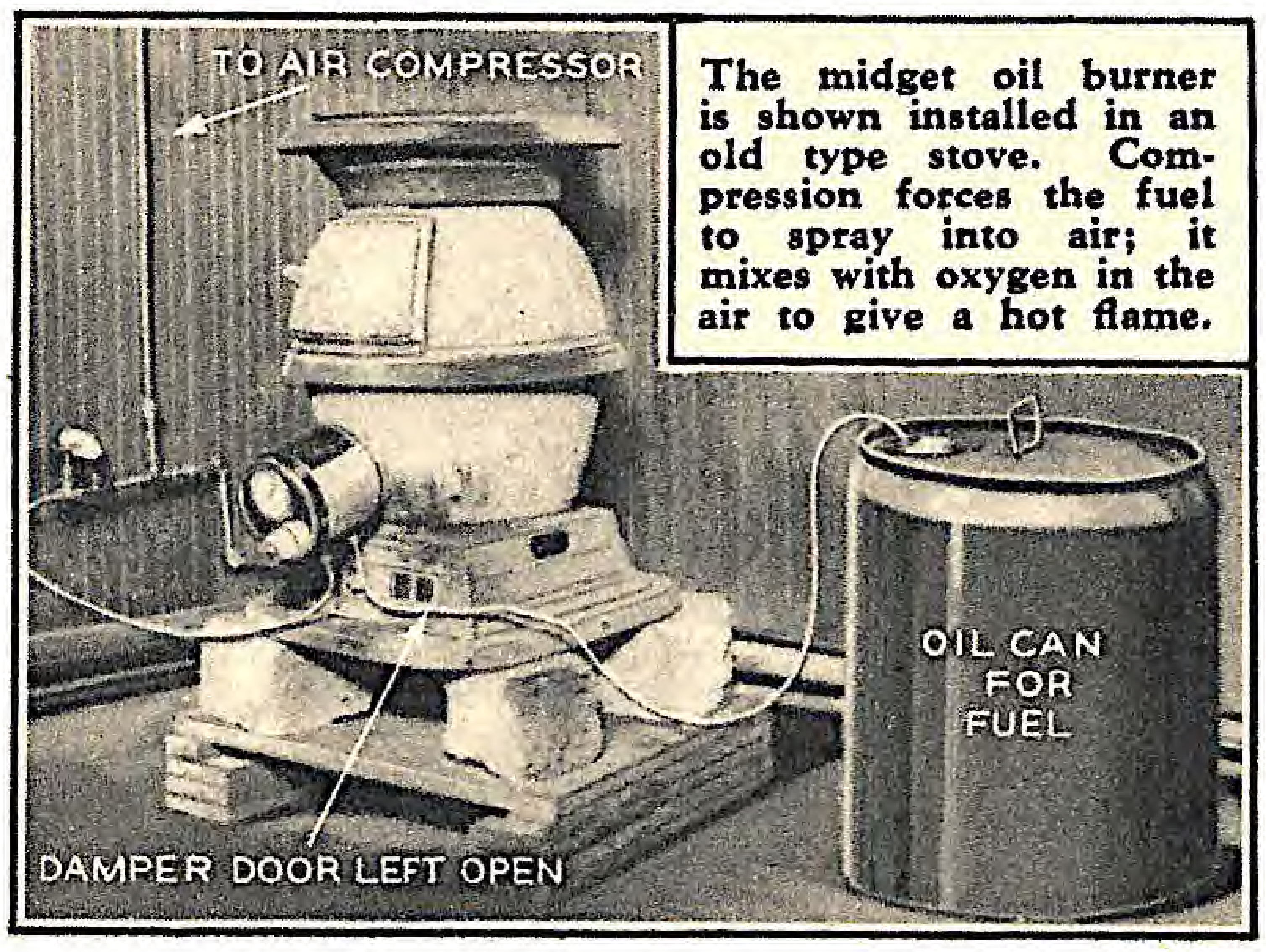
Oil Burning Unit Fits Any Stove

IN GARAGES and oil stations where compressed air is available, any old stove can be converted into an efficient oil burner. A new midget burner unit furnishing low cost heat makes this possible.

The burner consumes old crankcase drainings and fuel oil ranging up to a consistency of grade five, using from one to two pints per hour. A manual control on the front permits regulation from a short flame to a hot blaze.

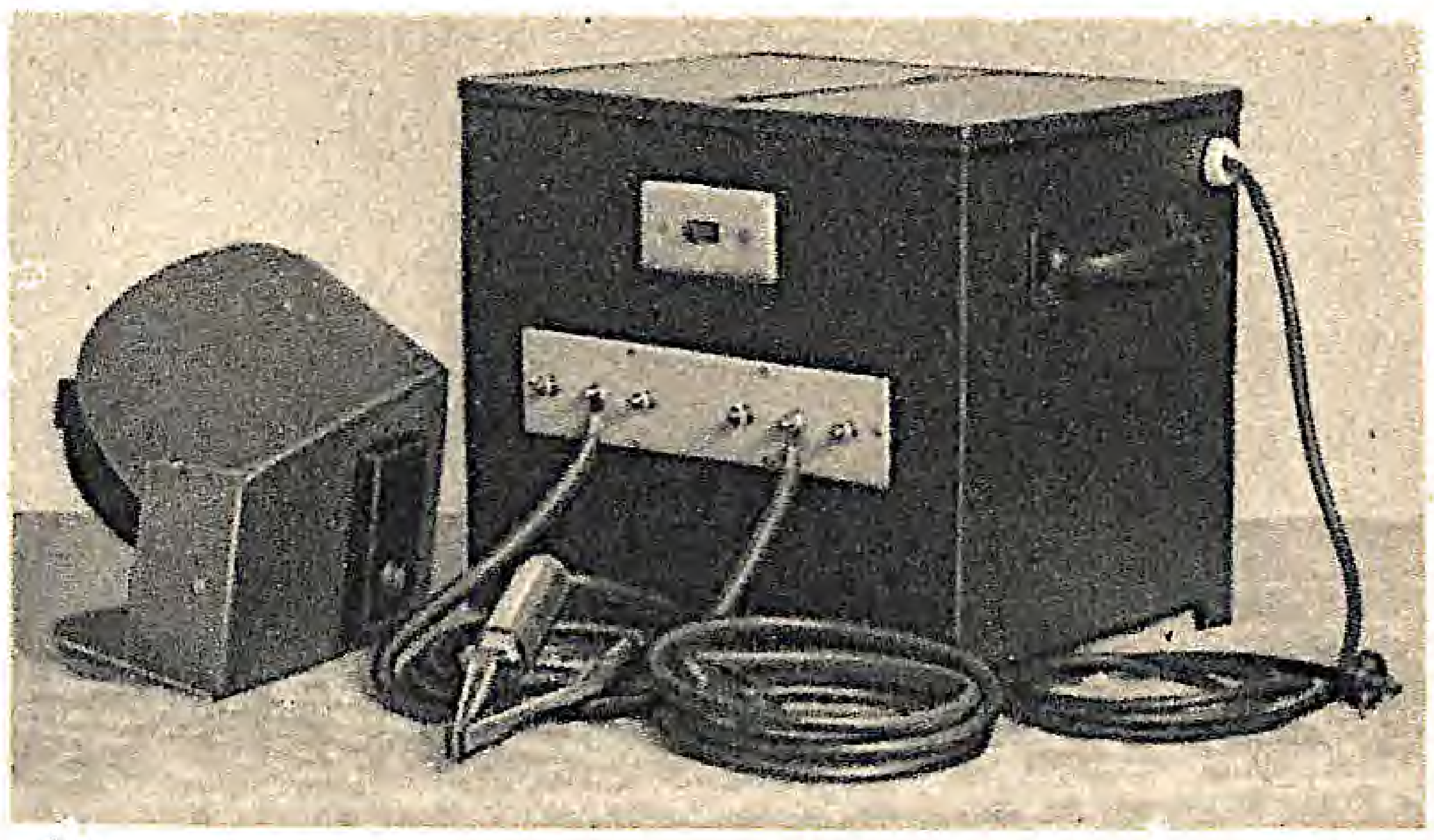
The burner may be used with any air compressor producing over two pounds of pressure per square inch.

The fuel is drawn from the tank by vacuum set up by the rush of air within the unit. Sprayed into the unit, it mixes thoroughly with oxygen to produce intense heat with very little oil consumption. Since the fuel tank is set on a level below the burner, oil flow stops when the flame is extinguished.



The midget oil burner is shown installed in an old type stove. Compression forces the fuel to spray into air; it mixes with oxygen in the air to give a hot flame.

Electric Arc Simplifies Welding

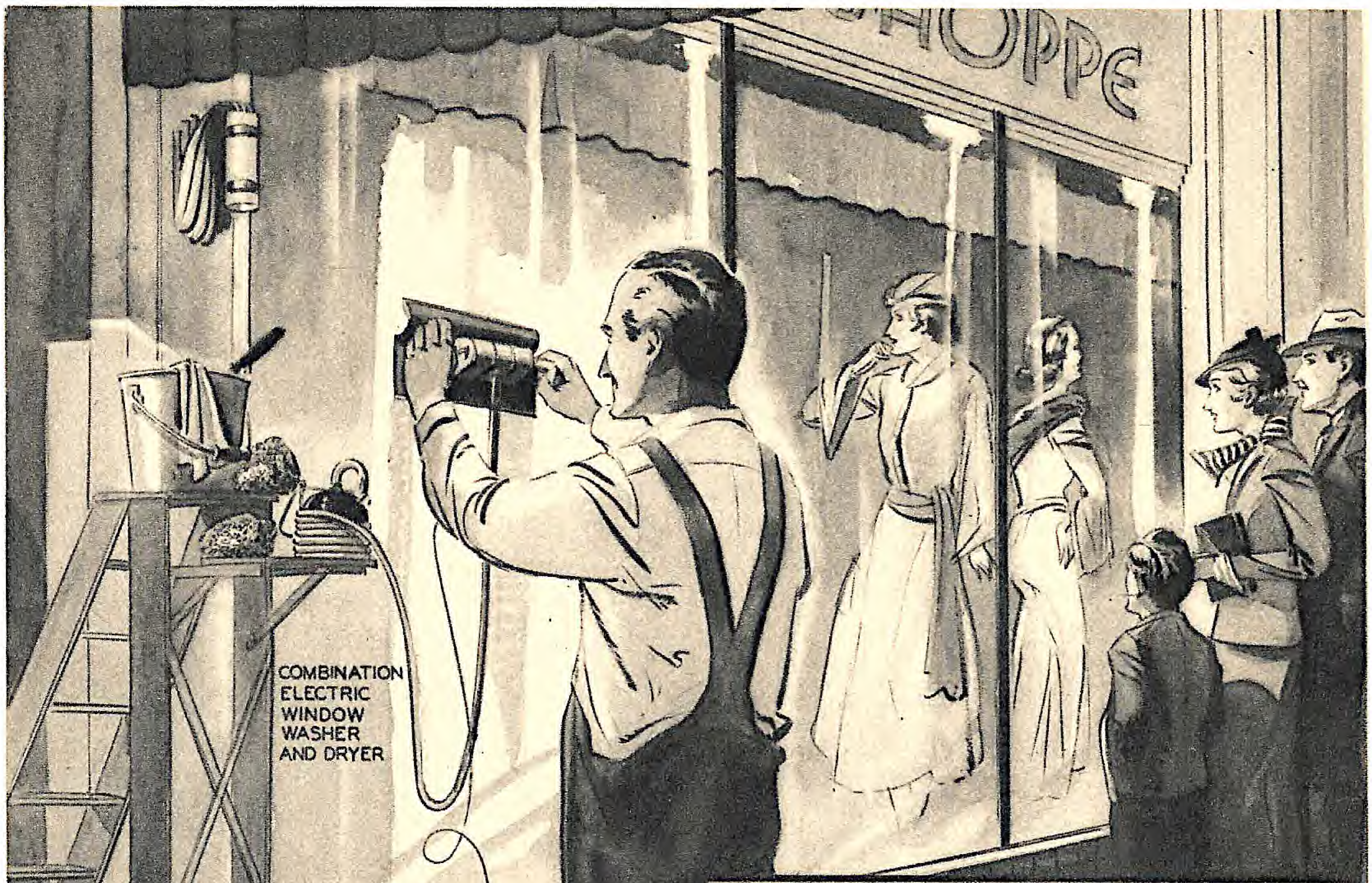


Electric arc welder operates without interruption. High frequency current maintains connection between electrode and work. Shield protects face from ultra-violet sunburn.

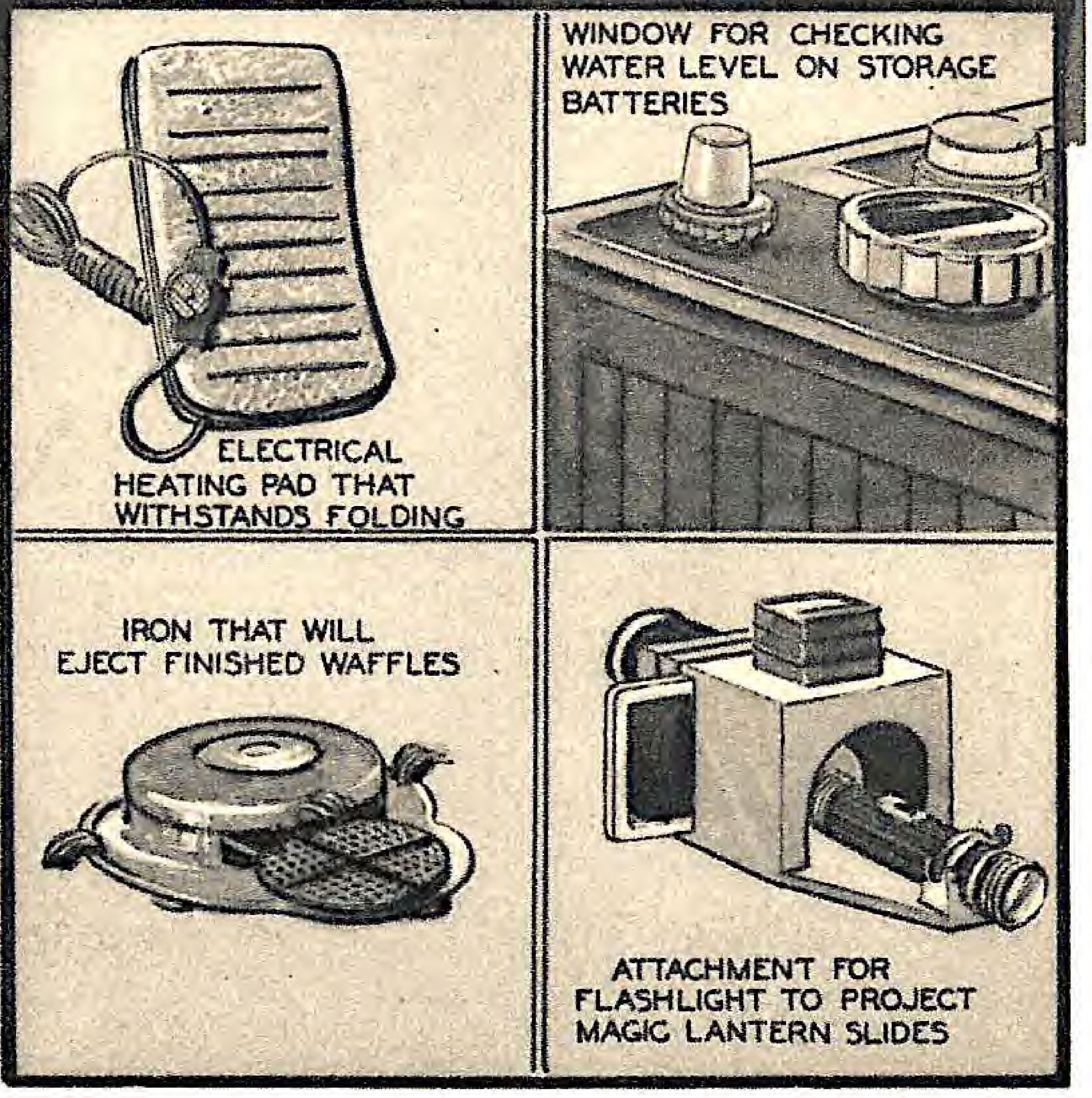
AN ARC welder that is said to perform continuous work without "freezing" or stopping has recently been perfected by a Minneapolis inventor. The welder features a high-tension spark which automatically flashes between the electrode and work, heating the air to make a pathway for the heavier current to follow. The welder eliminates adjustments when the current is broken, since as soon as the electrode approaches the work, the automatic spark again establishes the contact. This enables even a novice to handle welding work without knowing the intricacies of welder adjustment.

The welder is compactly enclosed in a light metal box and operates from any line carrying 110 or 220 volt alternating current.

NEEDED ELECTRICAL Inventions Offer FORTUNES in ROYALTIES


SHOPPE
COMBINATION ELECTRIC WINDOW WASHER AND DRYER

The American public is always receptive to electrical inventions and spends millions every year for electrical equipment. Secure advice on protecting ideas by writing Patent Editor, Modern Mechanix, 529 So. 7th St., Minneapolis, Minn.


ELECTRICAL HEATING PAD THAT WITHSTANDS FOLDING
WINDOW FOR CHECKING WATER LEVEL ON STORAGE BATTERIES
IRON THAT WILL EJECT FINISHED WAFFLES
ATTACHMENT FOR FLASHLIGHT TO PROJECT MAGIC LANTERN SLIDES

THE application of electricity to the workaday world provides the inventor with endless opportunity. Every year millions and millions of dollars are paid out in royalties to inventors who have been smart enough to take advantage of the needs of the now thoroughly electrically-minded world. And many millions more are yet to be paid for new ideas, as we are still in the dark ages of electricity.

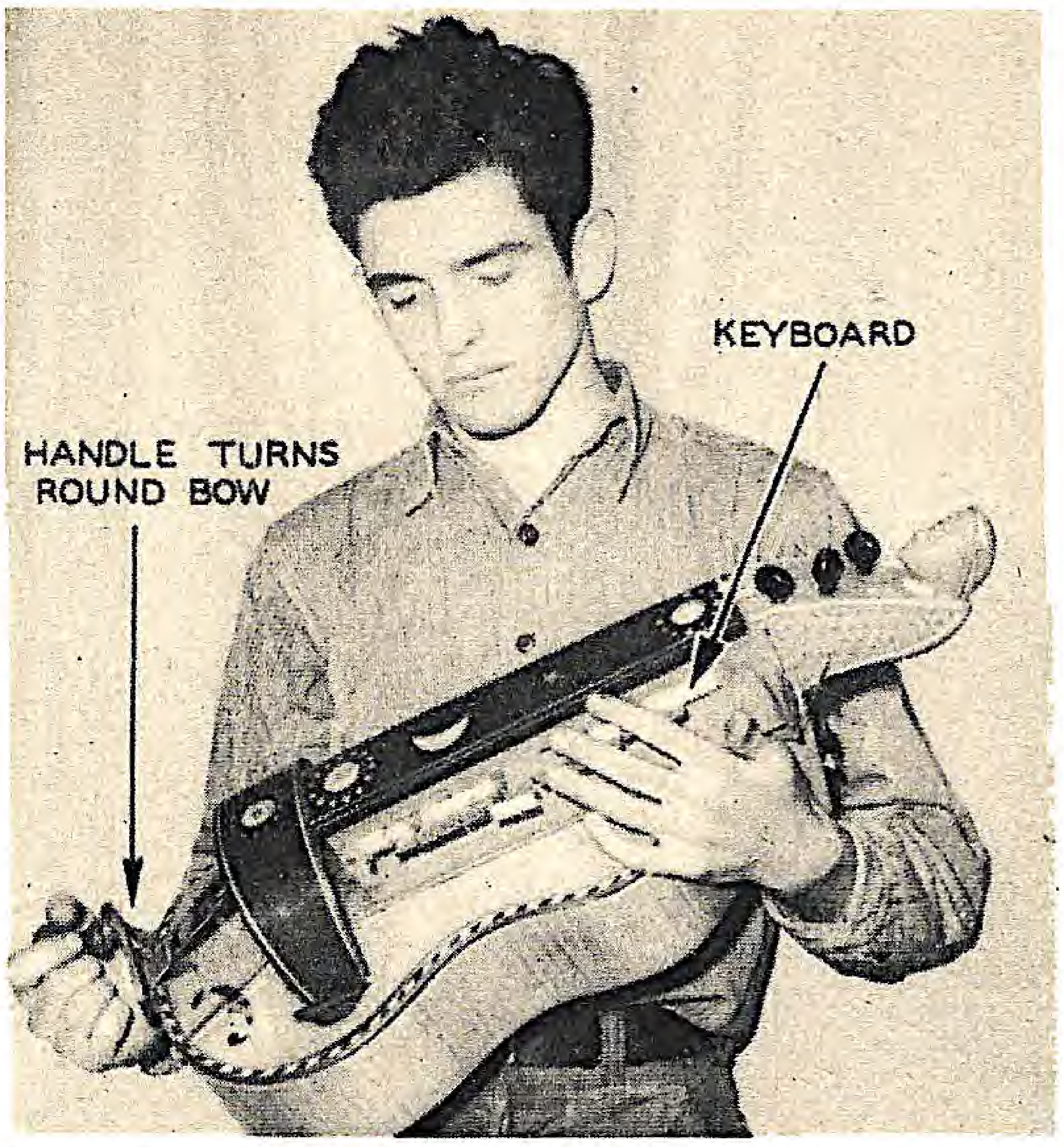
An electric door bell is needed with some sort of a regulating arrangement on the gong to produce different sounds after a simple adjustment. Thus, two bells made precisely the same could be adjusted as the front and rear door signals in the same house.

A small, improved heater of the bowl or reflector type could be arranged for use on auto windshields to melt snow and ice. To be effective, this device should be located on the outside and controlled from the inside of the car. To do this, it will be necessary to develop a swivel joint which can be manipulated from the interior of the automobile. Many makeshifts have been provided to solve this problem but the 100% device has yet to make its appearance.

An electric window washer of the right kind

[*Continued on page* 142]

Aged Automatic Violin Has Keyboard and Mechanical Bow



Theodore Ferretta demonstrates the automatic violin. The keyboard selects the tone; the crank turns a circular bow.

STRANGELY resembling a cross between a guitar and an old-fashioned zither, a bull-necked automatic violin, said to be the only one in the world, has been found in Oakland, Calif.

Experts, viewing the machine, state that it is a Thouvenel Henry instrument now probably worth thousands of dollars.

Instead of fingering the strings and using the conventional bow, the tones are selected on a fingerboard and sounded by turning a handle which controls a circular bow.

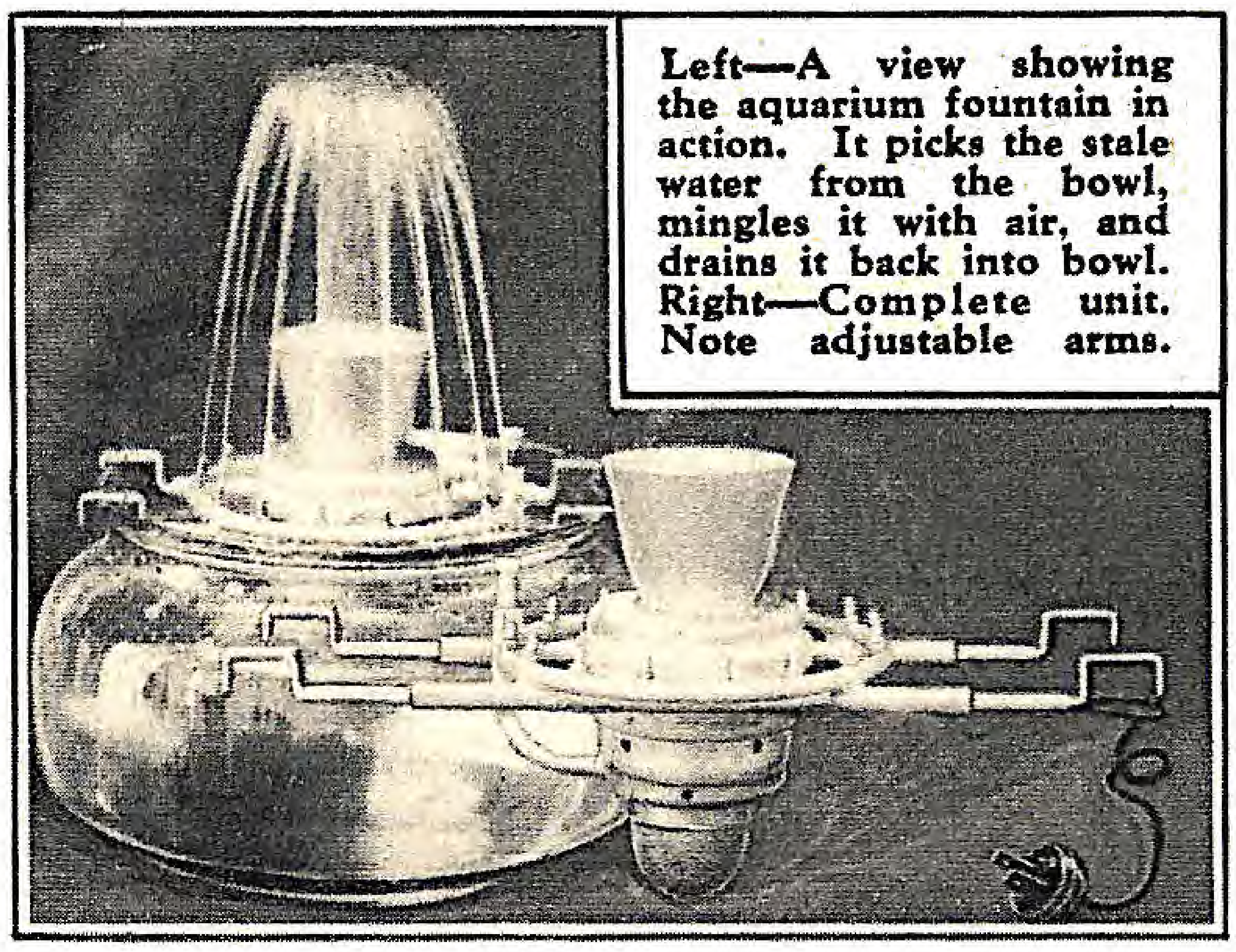
This rare old violin is now the property of John H. Ferretta. It was brought to California from Italy during the gold rush of 1849 by an old-time miner, John Pagantini, who used it to scrape out the bouncing melodies once so popular in the mining camps.

Tiny Fountain Aerates Aquariums

A DECORATIVE little fountain recently perfected to aerate aquariums is powered by a midget 1/250 horsepower motor and has a circle of spraying jets six inches in diameter.

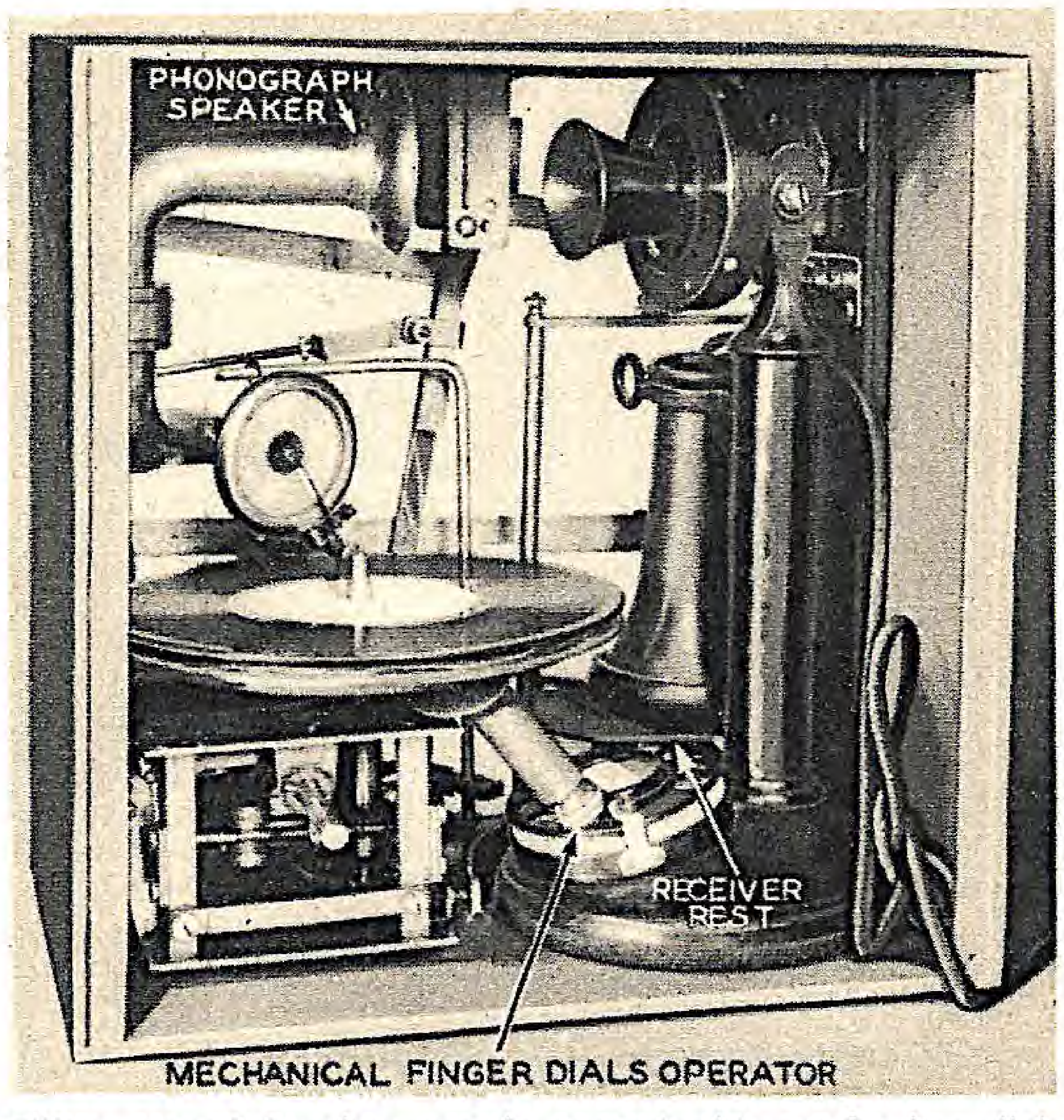
The motor, smaller than a doubled fist, is supported over the water-level of the fish bowl by adjustable handles. It is an 110 volt A. C. shaded pole motor and is said to run smoothly, without friction and without causing static disturbances in nearby radios.

The motor shoots water jets a foot high and into a center cup which drains into the aquarium. A screen on the intake prevents the fish from being drawn up into the device. Colored lights may be used in center cup if desired.



Left—A view showing the aquarium fountain in action. It picks the stale water from the bowl, mingles it with air, and drains it back into bowl. Right—Complete unit. Note adjustable arms.

Fire Alarm Talks Over Telephone



When set off by thermostatic control, this mechanism dials the operator and gives instructions as to location of fire.

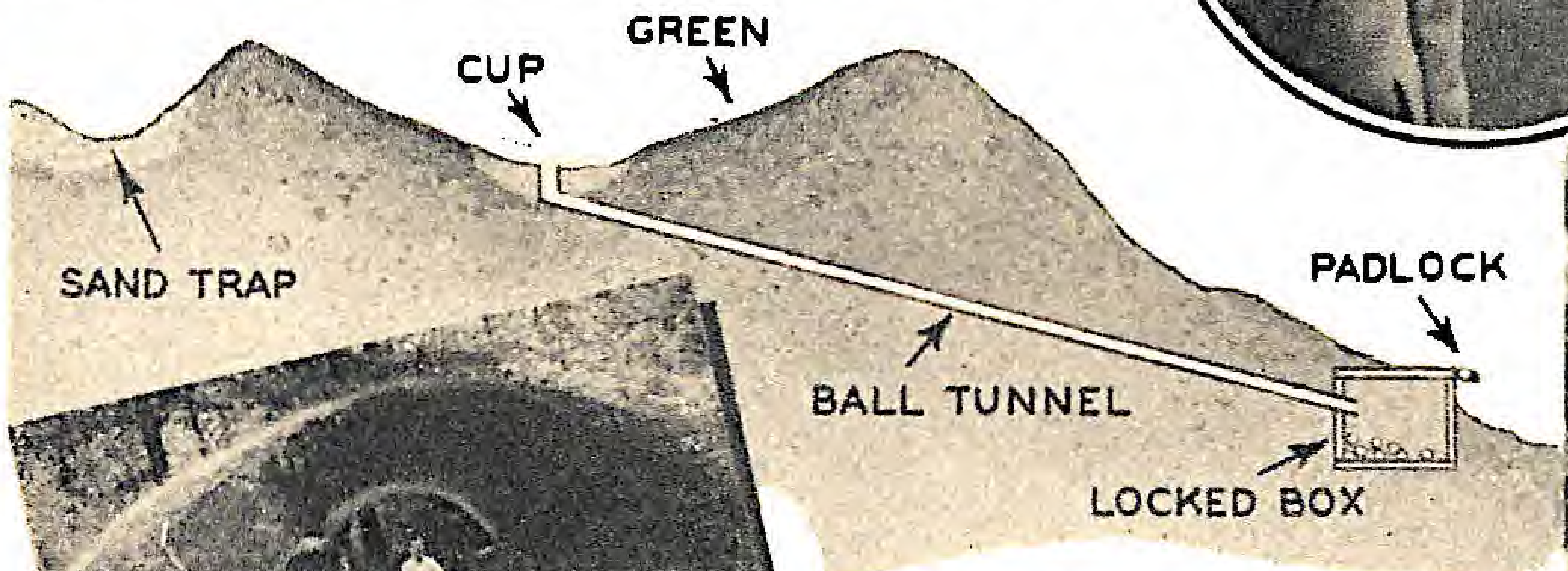
A PERFECT fire alarm, when heated, lifts a telephone receiver, dials the operator, informs her as to the exact location of the fire, and rings a guiding alarm.

The device is ingeniously controlled by a thermostat. When heated to the danger point, the thermostat sets the machinery in motion. A screw plate rises to lift the receiver, a metal finger dials the operator, and the phonograph starts repeating the directions, which, together with the loud gong, bring the fire-fighters directly to the scene.

TRICKS FOOL Guests at Comedian's Home

by **WALTER E. STEWART**

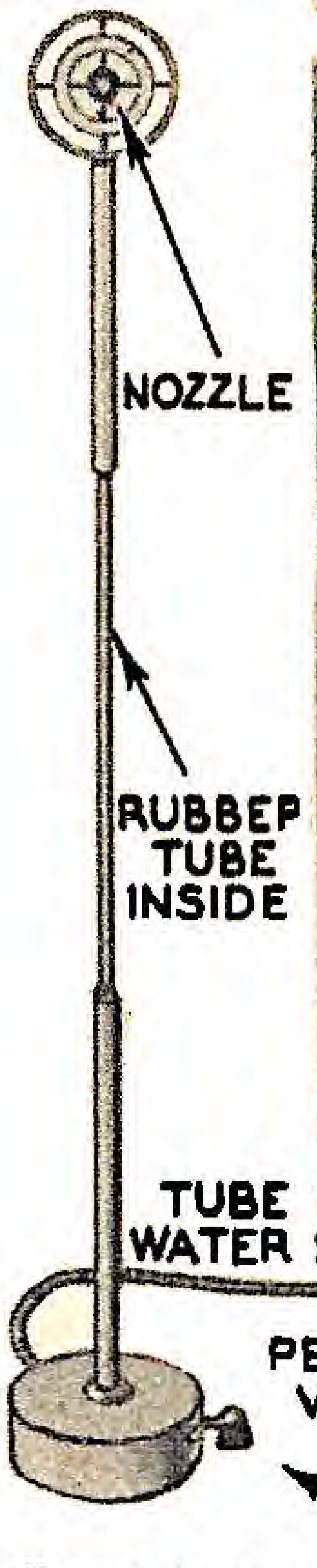
Above—A hole designed to soothe the angry golfer. Any ball on the green will roll into the cup. Below—A cross section of the green showing "lost ball" box.



Right—The first tee on Joe Cook's famous golf course is set on a stone tower. Anything but a good drive will land in treacherous traps below. In circle—Hitting this usually results in a broken club.

Joe Cook, Jr., examining a bronze crab through an enlarged magnifying glass.

Left—The only approach to this green is through a five-foot tunnel inclined downward to the cup. The other three sides are rough and heavily wooded.



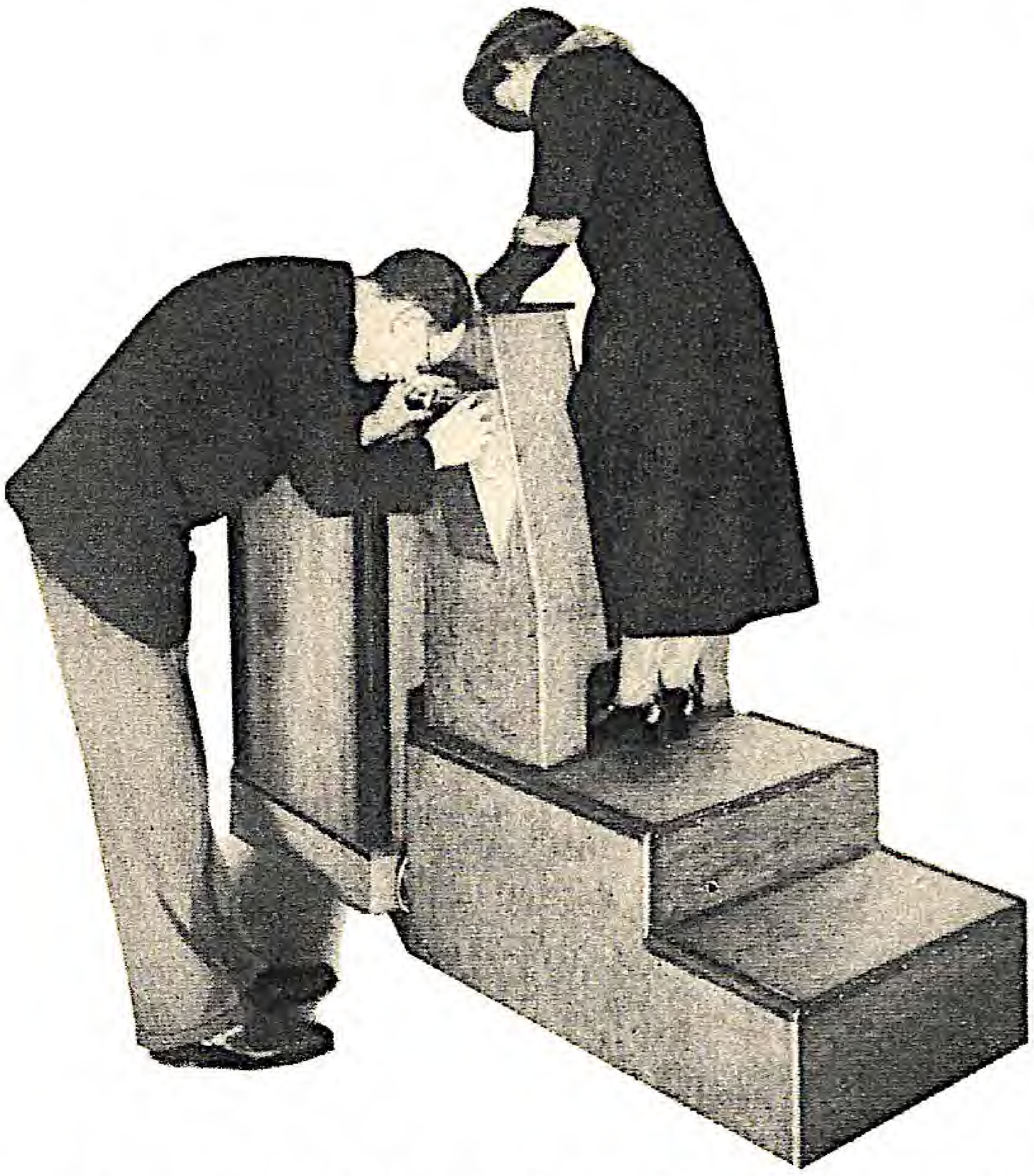
Above—A corner of the recreation room showing the trick microphone and billiard table that hurls balls from the pockets. Microphone ejects water at person before it as shown in detail sketch at left.

WATER in the eyes of ambitious crooners, shattered golf clubs resulting from driving anchored golf balls, driving tees on stone towers, and lost balls after perfect putts are but a few of the maze of bewilderments which face the unsuspecting guest at the country estate of Joe Cook, noted stage comedian.

Always in search of a harmless joke, Joe has incorporated into his home, Sleepless Hollow, hundreds of comic devices, ranging from vexing, misdirecting gate-signs to an elaborate trick golf course costing thousands of dollars.

Singers and entertainers are often asked to step to the microphone in the basement to entertain the guests in Joe's little theater in the next room. With a loving familiarity known only between entertainer and microphone, they put their lips near the instrument and begin their songs—only to have them finished in a gurgling sputter as a jet of water shoots from the microphone propelled by the pressure of Joe's foot on a pneumatic bulb at the base of the stand.

X-Ray Machine Aids Salesmen To Give Scientific Shoe Fit



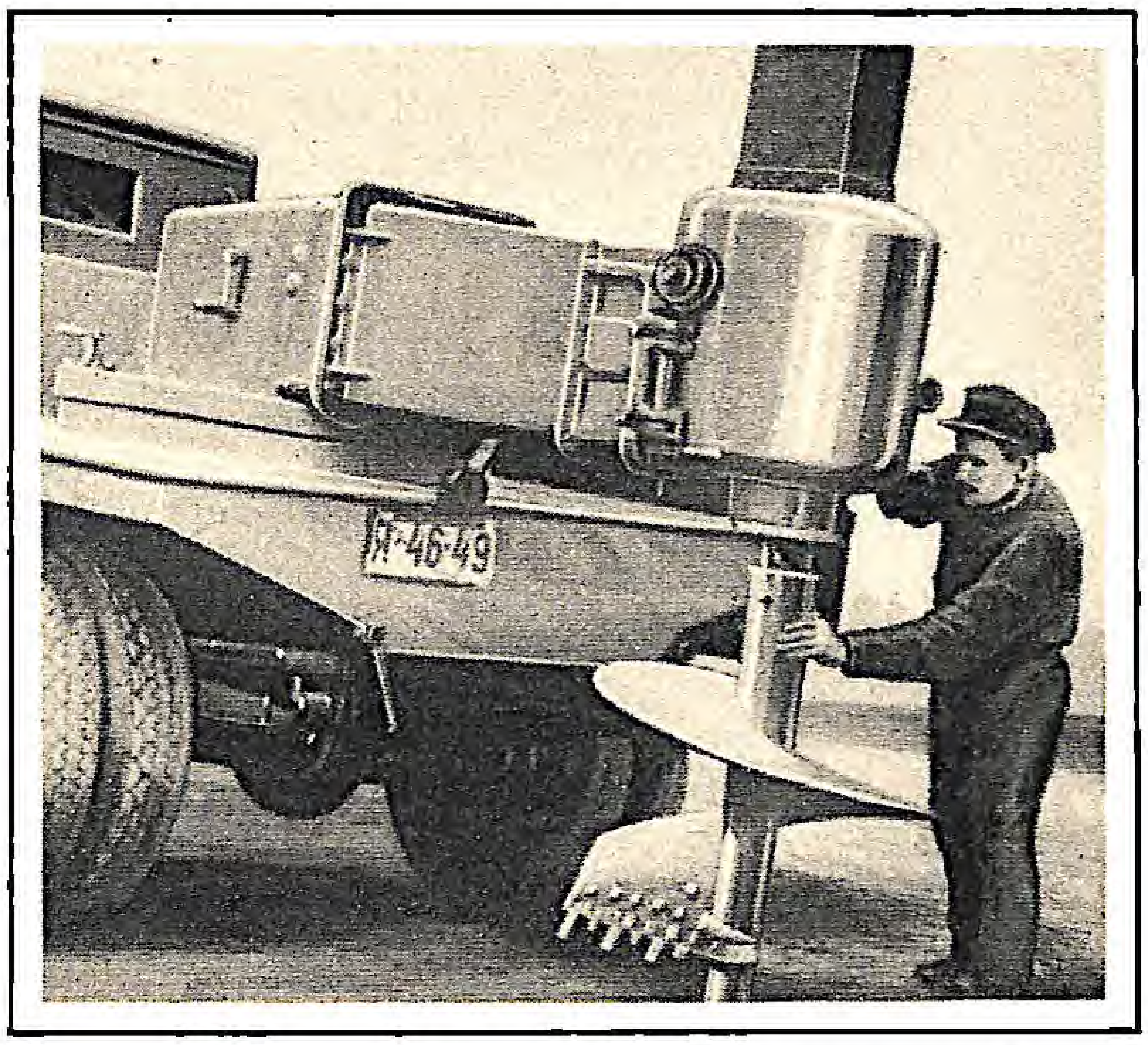
The customer puts foot through hole in machine and looks through the view plate to see how the shoe fits the foot.

AN X-RAY machine that allows both the salesman and customer to tell at a glance how a new shoe conforms to the contour of the foot is designed to permit scientific fitting of a shoe without guess work. It overcomes the difficulty of fitting people with sensitive feet and eliminates the necessity of wearing a shoe for several days to determine whether or not it fits.

The process is not complicated. The customer, after slipping on a pair of shoes, steps onto the platform and inserts his feet into a hole cut in the front of the machine. The salesman presses a button to start the current and the X-ray reveals just how the shoe fits. Since there is an observation hole on either side, mothers can easily supervise the fitting of a child's shoe.

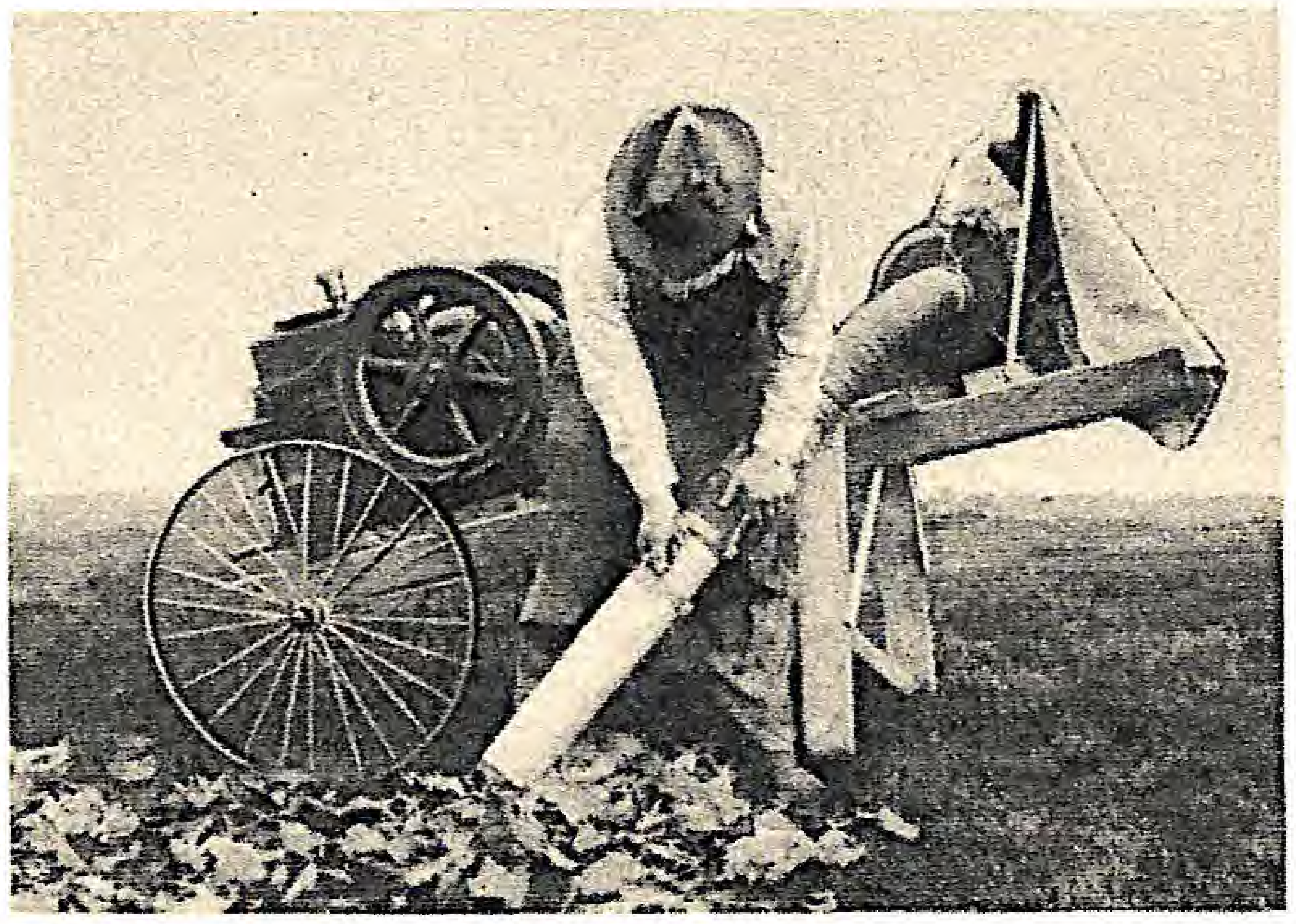
Huge Bore Drills Tree Holes

TO INCREASE speed in carrying out their gigantic tree-planting program, the city of Moscow has mounted huge boring machines on the back of heavy trucks to dig holes for planting. The screw-type bore is backed into position by the truck where a large motor drives it easily through the hard ground. Using several of these machines, the Soviet planted over a million trees in Moscow during the year 1934.



In order to speed their tree-planting program, Moscow engineers devised above machine to dig the holes for planting.

Vacuum Cleaner Scoops Up Leaves

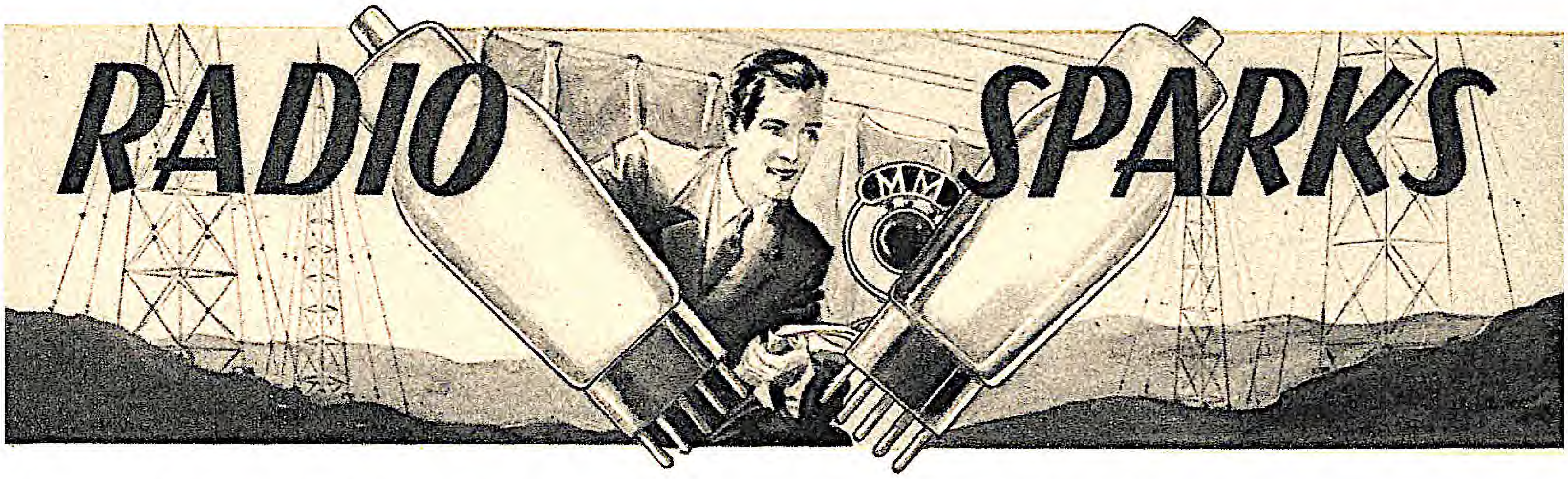


The gasoline motor, set on a two-wheeled truck, sets up a vacuum which draws the leaves up through suction pipe.

FINDING the task of raking the lawn each fall rather tiresome, an Oregon man has devised a vacuum cleaner that allows him to walk easily along, scooping up leaves in record time. There are no backaches or blistered hands connected with his process. He simply mounted a gasoline engine on a two-wheeled cart. The engine creates a vacuum to scoop the leaves through a suction pipe into a canvas hopper.

Recordings Replace Opera Chorus

ELECTRIFIED opera in which only the stars actually sing have been produced with great success in Europe. The principles of the cast sing from the stage and are accompanied by choral recordings played in the wings.



Transformerless Radio Battery Charger Delivers 5 Amperes

DISCHARGED radio storage batteries can be brought up to full charge in less than two days with this heavy duty electrolytic charger. Lead and aluminum plates dipping into a borax solution do the rectifying; a 600-watt electric iron or heater element reduces the voltage to the correct value for charging purposes.

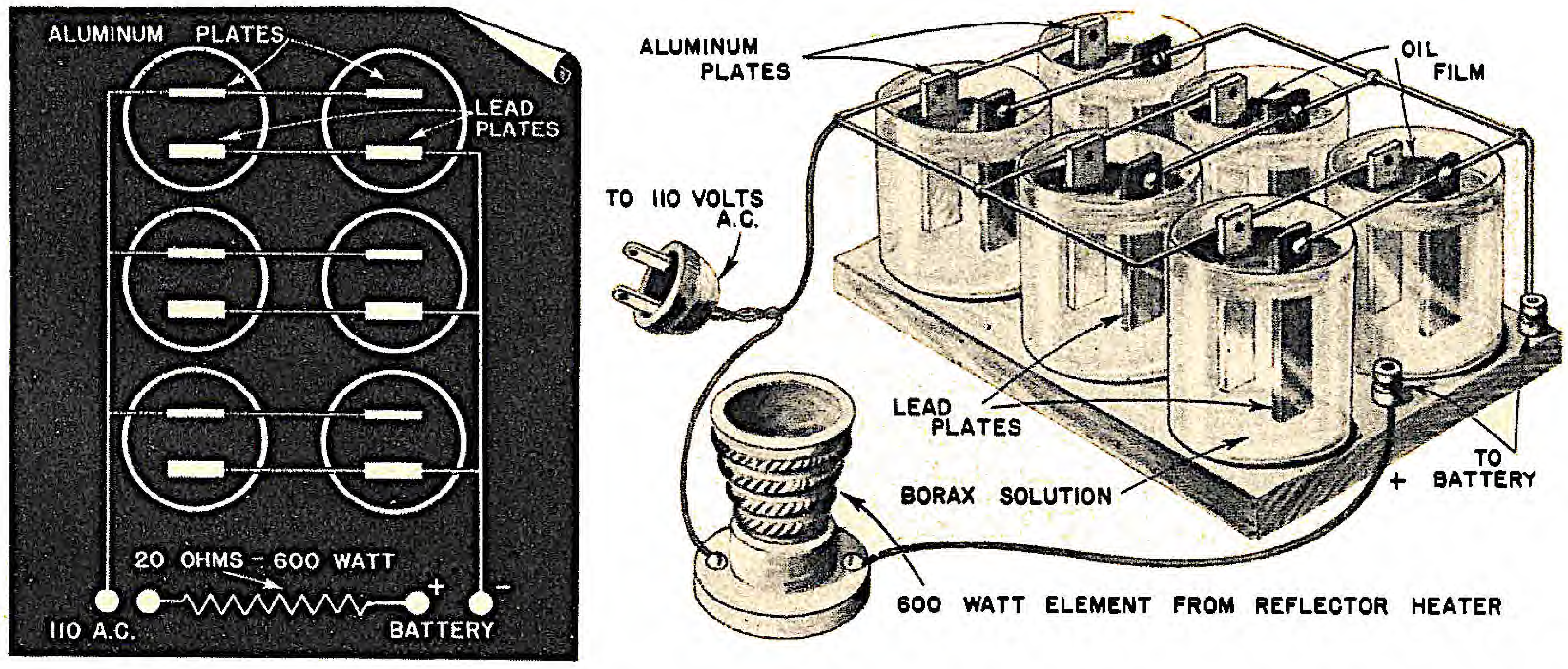
Obtain six wide-mouth glass jars. No covers are needed, since the heavy copper wires connecting the plates are more than strong enough to keep them in position. Attach these wires to the plates exactly as shown in the sketch, using nuts and bolts to get tight joints.

Prepare the solution by placing about 15 cents worth of borax in a crockery dish, pouring in 2 quarts of boiling water, and allowing it to cool. Pour off the clear liquid and use it in your charger jars. The remaining crystals may be used over again when needed.

This solution will handle 5 to 6 amperes quite easily without heating. To make sure that all the plates are working, watch for tiny bubbles around the edges of the plates after the rectifier has been in operation for a few minutes. Measure the charging current with an auto ammeter.

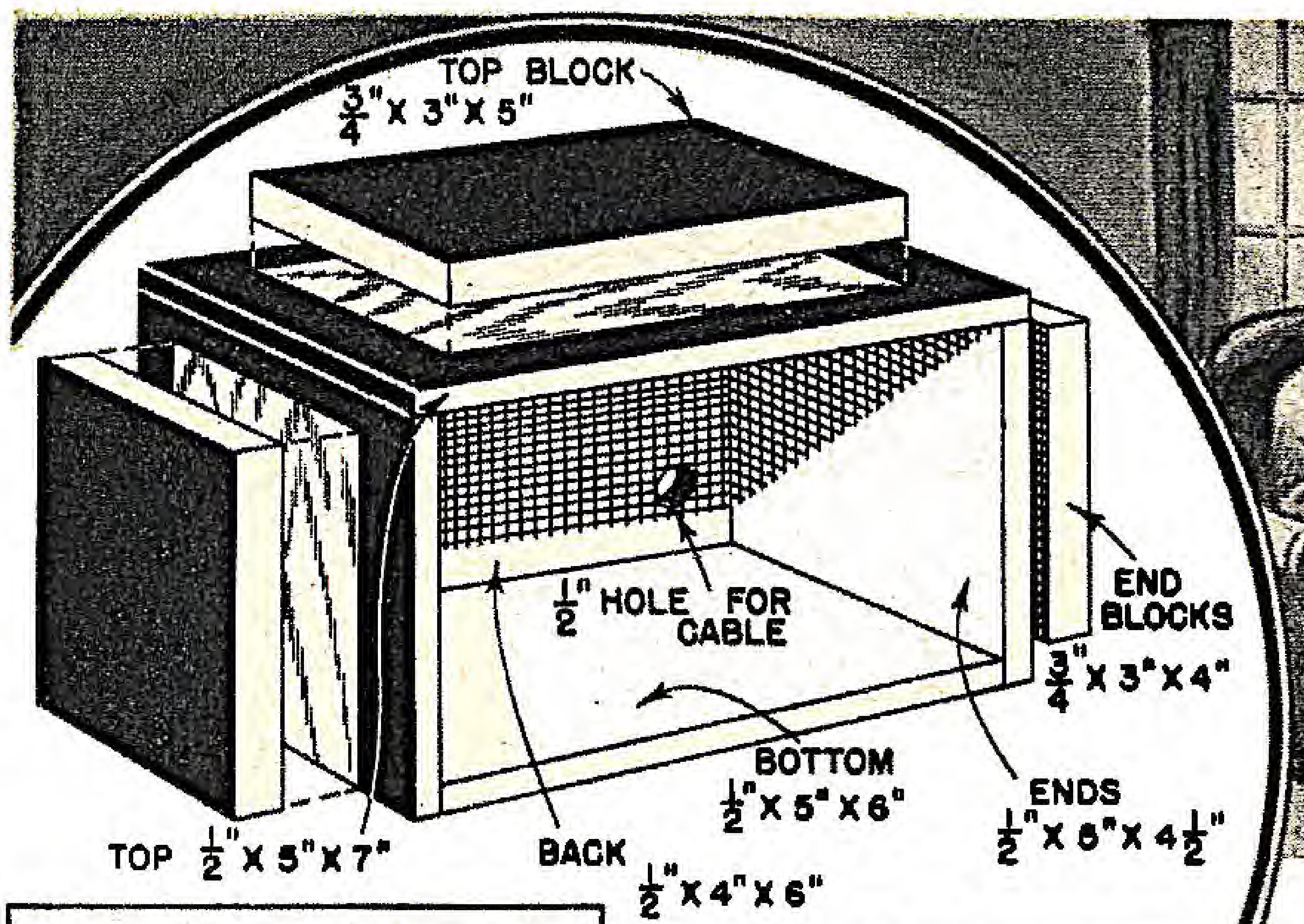
If no bubbles appear at your electrodes, and no D. C. current passes through the battery, you will have to use a higher voltage to "form" the plates. Connect the cells across the high-voltage secondary of a radio power pack transformer, place a lamp in series with the primary, and turn on the current. As the rectifier begins to form, and the lamp grows dim, connect more lamps in parallel until the rectifier will hold back the full voltage. Usually, however, your plates will form automatically on the 110 volt A. C. line.

The unformed cells are not able to rectify properly, and have almost the same effect as a dead short. When first connecting up the charger, watch the ammeter carefully, to be sure your battery is not discharging through the charger.

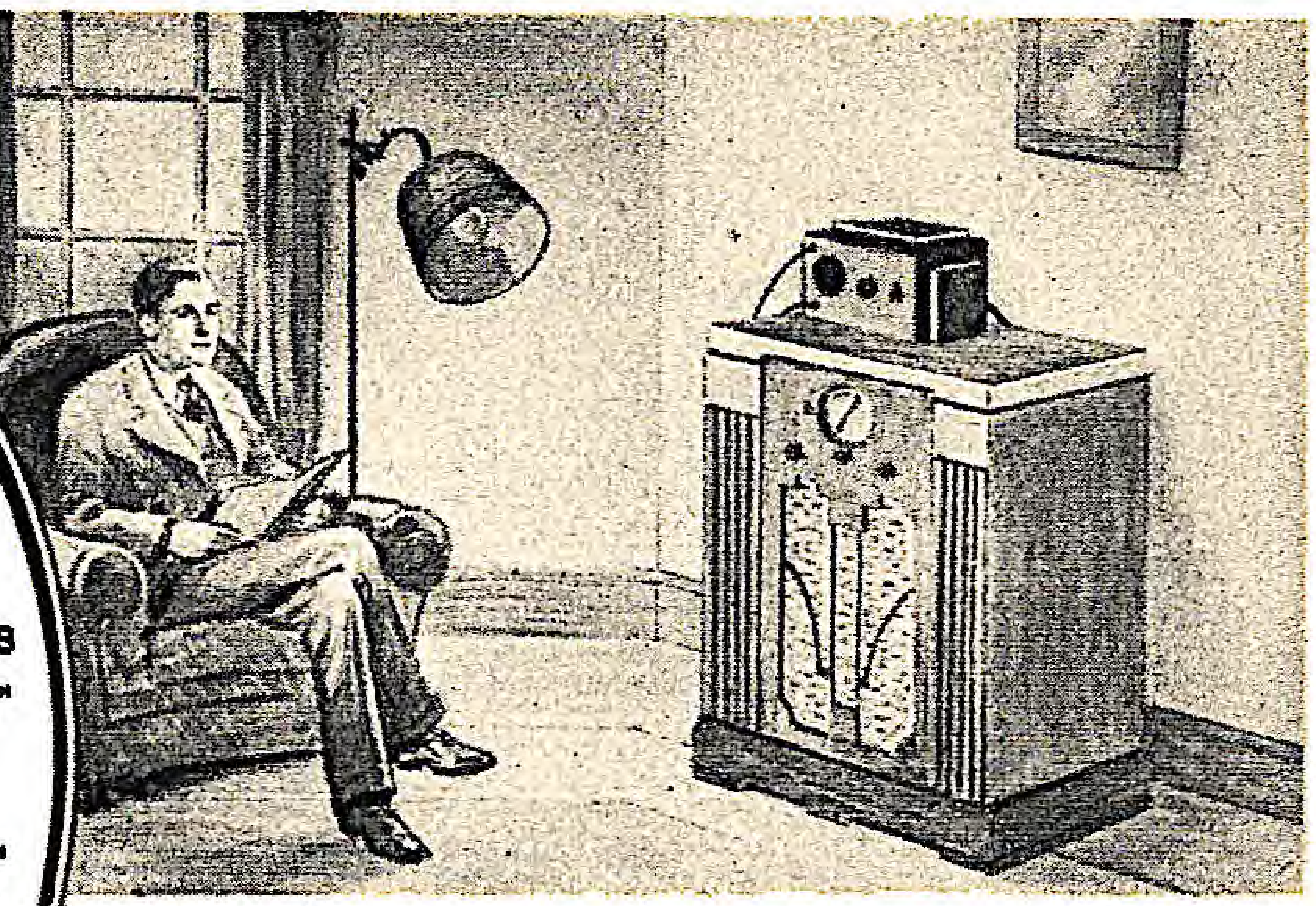


Construction of heavy duty electrolytic charger is shown above. Aluminum plates will gradually wear away, and may need replacement. Size of plates determines current which will pass; thickness determines life of plates. Pour film of clean oil over solution in each jar to prevent evaporation. Iron or copper may be used in place of lead. Baking soda (½ oz. to gallon of water) works as well as borax. Current density is about 100 ma. per sq. in. of immersed aluminum surface.

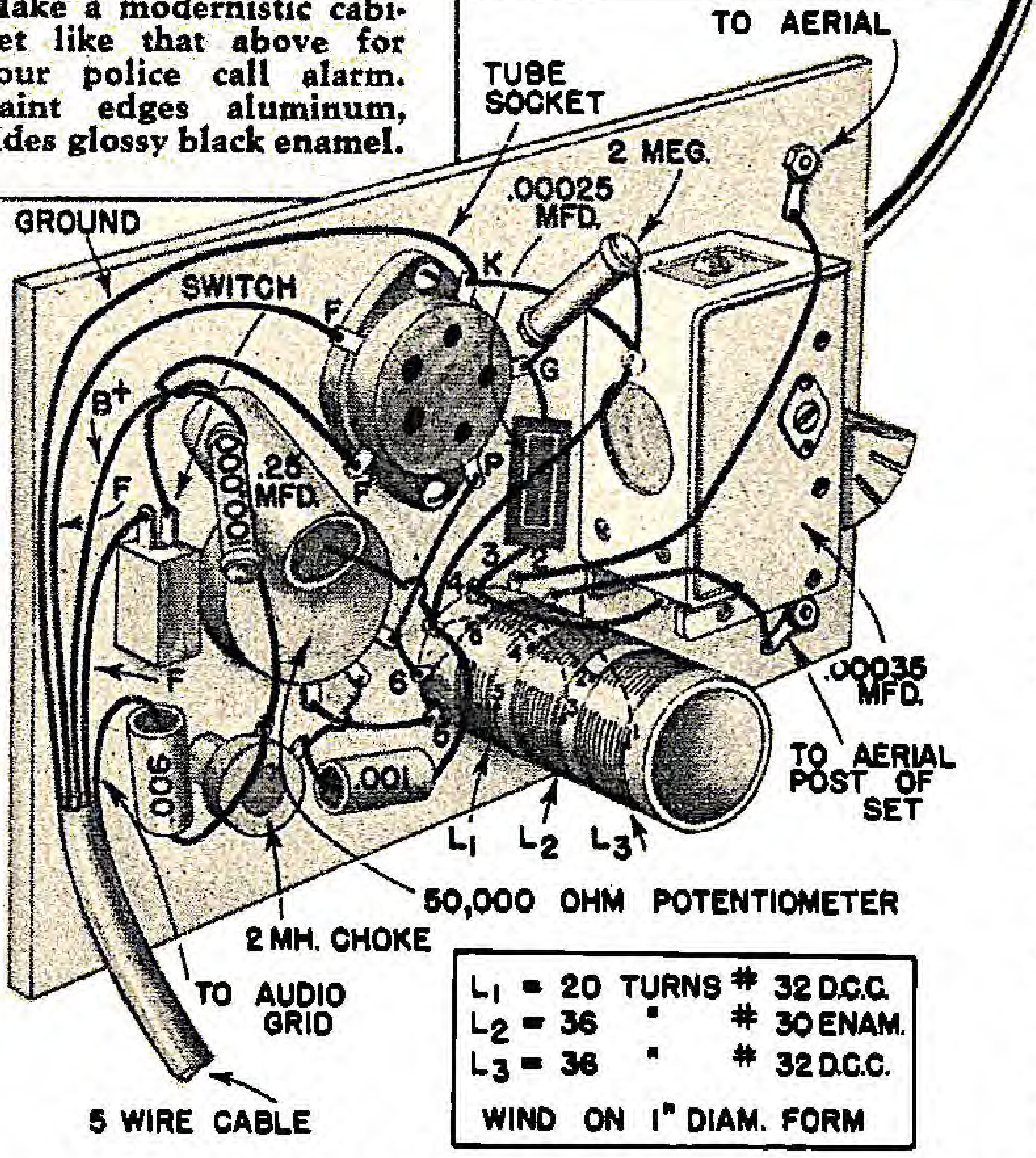
Hear POLICE CALLS, Music, at Same Time


TOP BLOCK
3/4" X 3" X 5"
1/2" HOLE FOR CABLE
END BLOCKS
3/4" X 3" X 4"
BOTTOM
1/2" X 5" X 6"
ENDS
1/2" X 5" X 4 1/2"
TOP 1/2" X 5" X 7"
BACK
1/2" X 4" X 6"

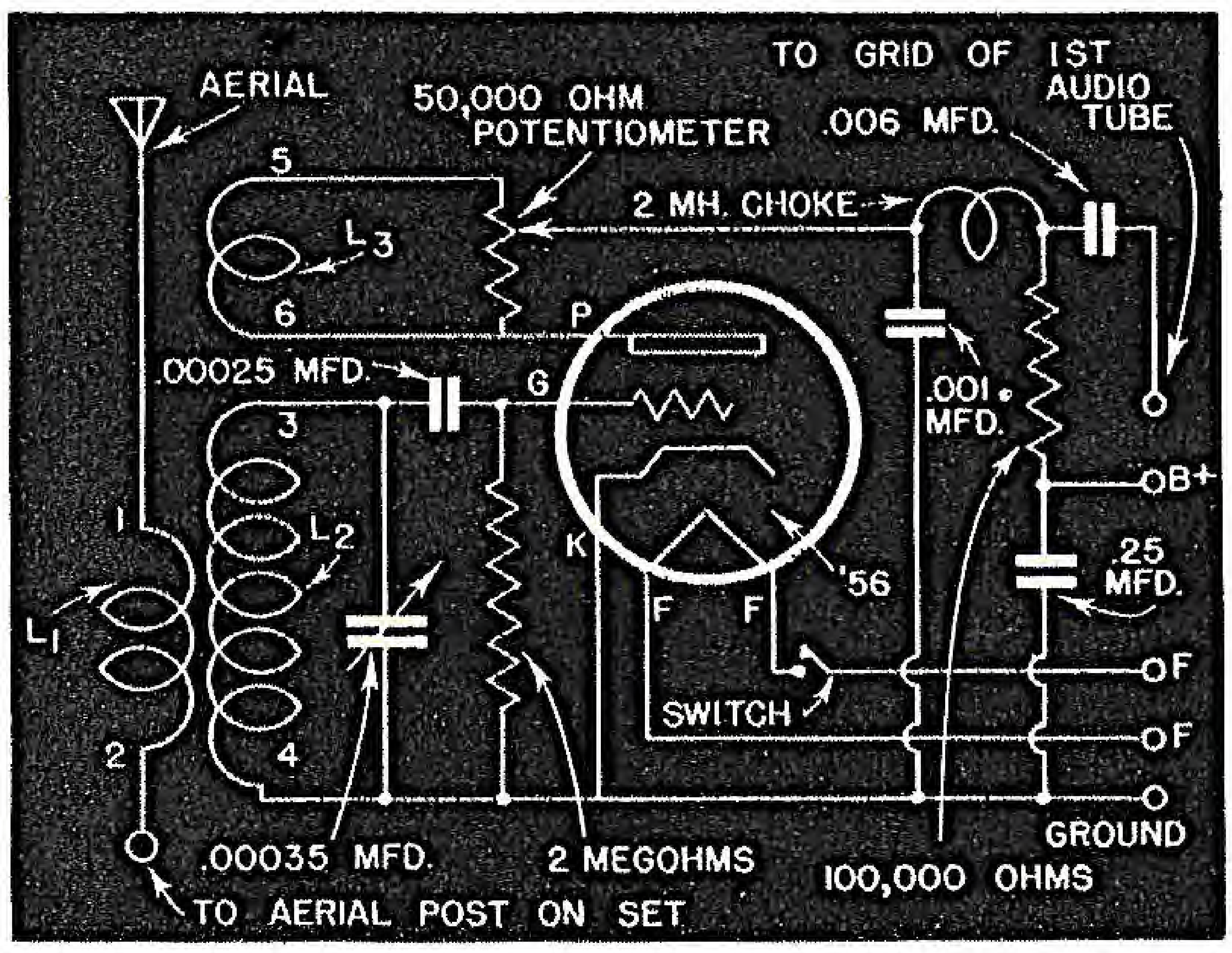
Make a modernistic cabinet like that above for your police call alarm. Paint edges aluminum, sides glossy black enamel.



Mounted in attractive cabinet atop regular receiver, this police call alarm automatically brings in local police calls over regular programs. One tube circuit is used.


TO AERIAL
TUBE SOCKET
2 MEG.
.00025 MFD.
GROUND
SWITCH
K
F
G
B+
.25 MFD.
F
P
3
2
4
6
5
F
.00035 MFD.
TO AERIAL POST OF SET
.006
.001
L1 L2 L3
50,000 OHM POTENTIOMETER
2 MH. CHOKE
TO AUDIO GRID
5 WIRE CABLE
L1 = 20 TURNS # 32 D.C.C.
L2 = 36 " # 30 ENAM.
L3 = 36 " # 32 D.C.C.
WIND ON 1" DIAM. FORM

Mount parts on panel as shown. Make 2 mh. choke coil with 200 turns of No. 32 d.c.c. wire, jumbled, on pencil core.


AERIAL
50,000 OHM POTENTIOMETER
TO GRID OF 1ST AUDIO TUBE
.006 MFD.
2 MH. CHOKE
5
L3
6
P
.00025 MFD.
G
3
.001 MFD.
B+
1
L2
L1
K
'56
.25 MFD.
F F
F
SWITCH
F
2
4
GROUND
.00035 MFD.
2 MEGOHMS
100,000 OHMS
TO AERIAL POST ON SET

Potentiometer may be any value from 50,000 to 250,000 ohms. Rating for .25 mfd. condenser is 400 volts. Other condenser sizes are not critical—use closest size you have.

WITH this police call alarm connected to your radio receiver you can listen in to broadcast programs at any time, yet hear every police call sent out from your local police station without touching the receiver controls. These calls are heard with enough volume to make them easily understood regardless of the type of program being received, provided the police radio station is within ten miles of your home.

The alarm is simply a regenerative detector circuit tuned to the police wave band and coupled into the audio circuit of your receiver. All power for the alarm is taken from your set.

For sets with 2½ volt filament tubes, such as the '27, '24A, '35, '57, '2A5, etc., a '56 tube should be used. Tap off this filament power as near to the power transformer as possible. For sets with 6.3 volt tubes, use a '37 tube in the alarm.

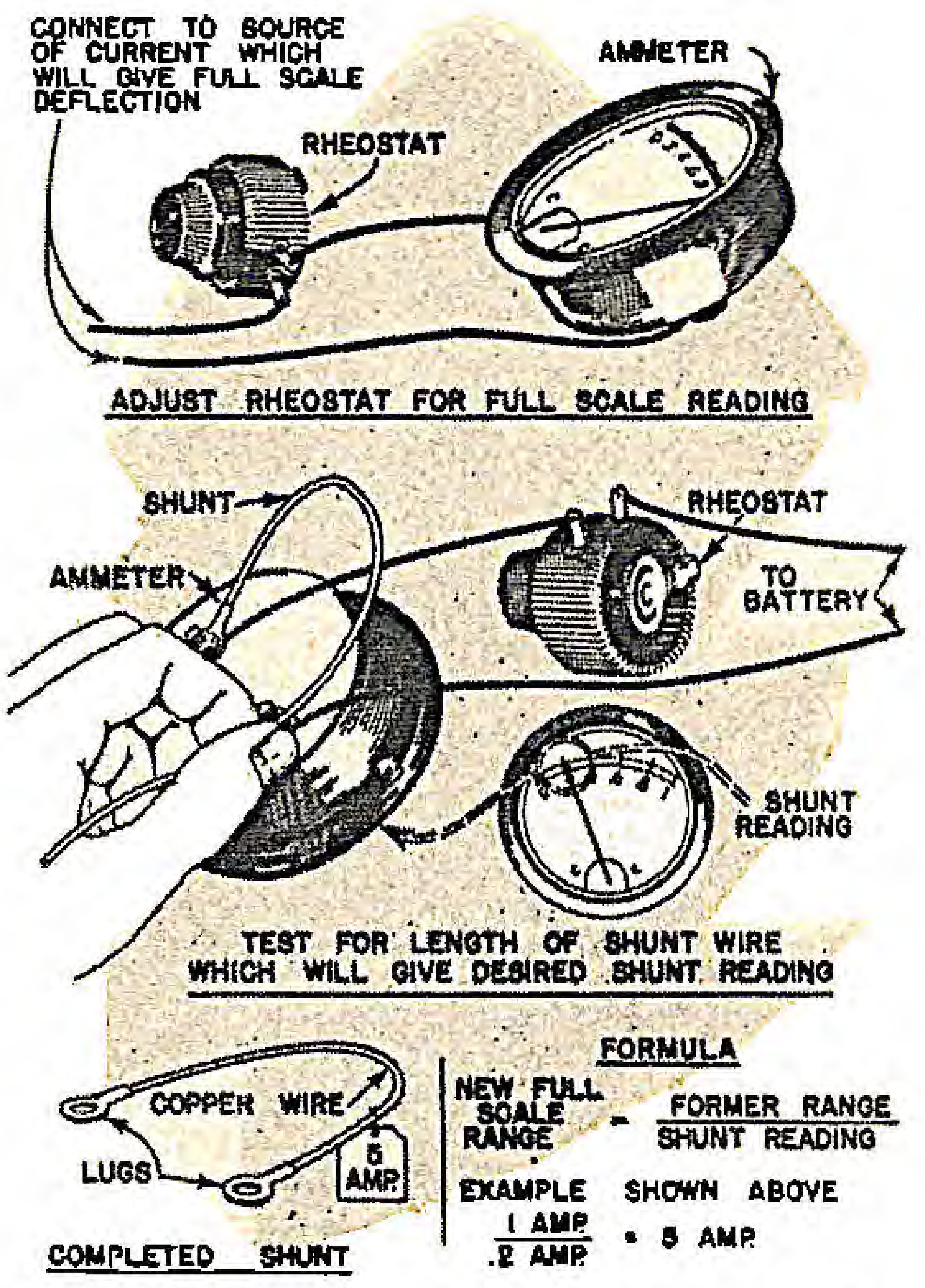
To operate, turn on the receiver and the police call alarm. With no broadcast program tuned in, advance the potentiometer on the alarm until the hissing sound of regeneration is heard. Slowly tune the .00035 mfd. condenser until you hear a call from your local police station. Readjust the potentiometer for clearest reception of this police signal. No further adjustments are necessary. The switch turns off the alarm when police calls are not wanted.

The coil L1 is connected in series with the aerial of your receiver. Other connections to the receiver are made with a five-wire cable. B plus voltage is taken from the plate supply of your receiver by connecting to the plate of the output tube.

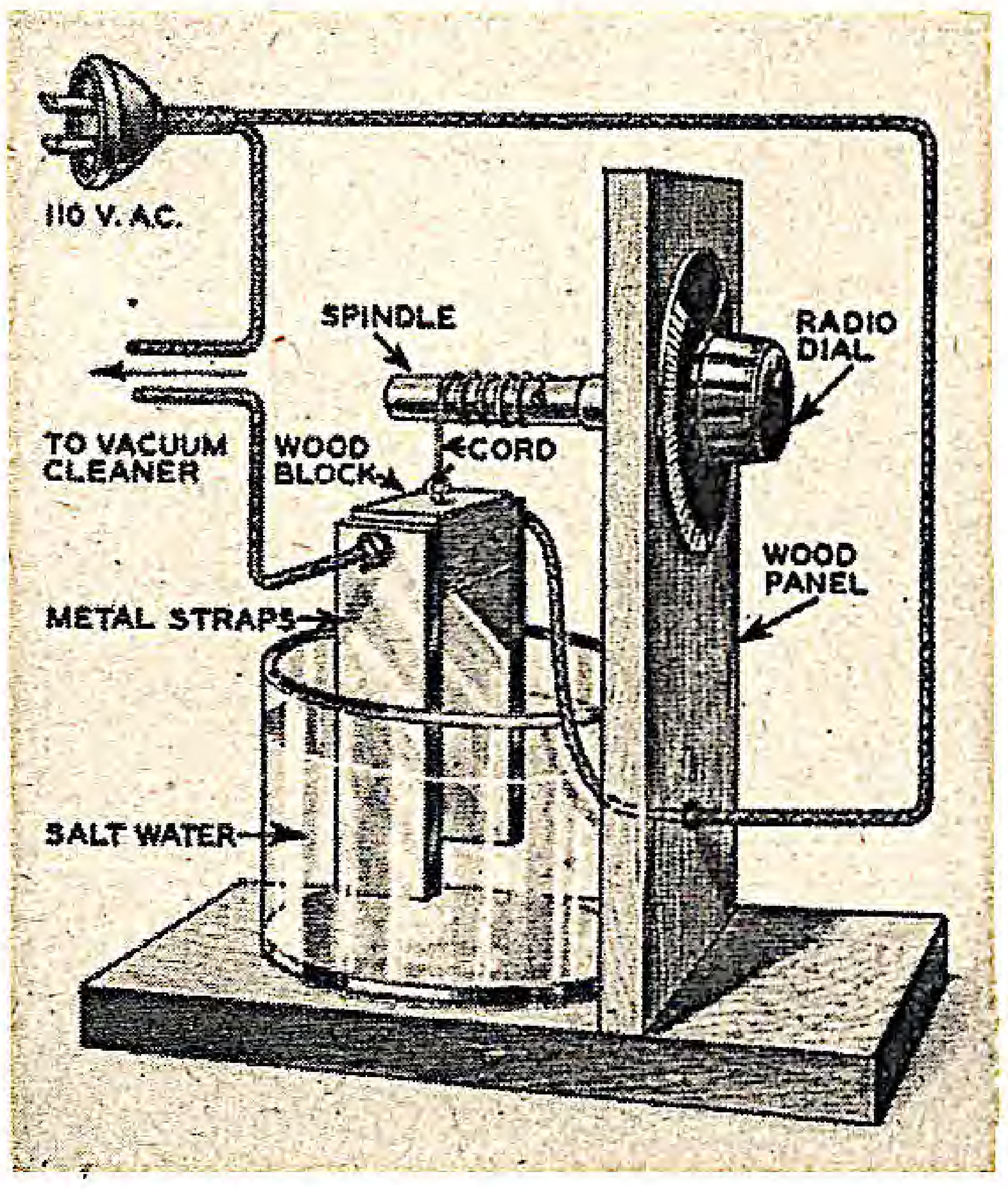
RADIO TESTING SHORT-CUTS

Home-Made Shunts Increase Range Of Ammeter

HIGHER ranges are often required for D. C. ammeters, to measure currents which usually would give an off-scale deflection. This method enables you to make a complete set of accurate shunts. Connect the ammeter to read full scale. Now connect across the meter terminals a length of fairly heavy wire which will lower the meter reading. Then use the formula shown. In the sketches at right is an example showing how a 5 ampere shunt is made for a 1 ampere meter. Select a size of wire which will not have to be too long, or get too hot. Solder heavy terminal lugs to each end of the short wire after determining correct length.


CONNECT TO SOURCE OF CURRENT WHICH WILL GIVE FULL SCALE DEFLECTION
AMMETER
RHEOSTAT
ADJUST RHEOSTAT FOR FULL SCALE READING
SHUNT
RHEOSTAT
AMMETER
TO BATTERY
SHUNT READING
TEST FOR LENGTH OF SHUNT WIRE WHICH WILL GIVE DESIRED SHUNT READING
COPPER WIRE
LUGS
5 AMP.
COMPLETED SHUNT
FORMULA
NEW FULL SCALE RANGE = FORMER RANGE / SHUNT READING
EXAMPLE SHOWN ABOVE
1 AMP / .2 AMP = 5 AMP.

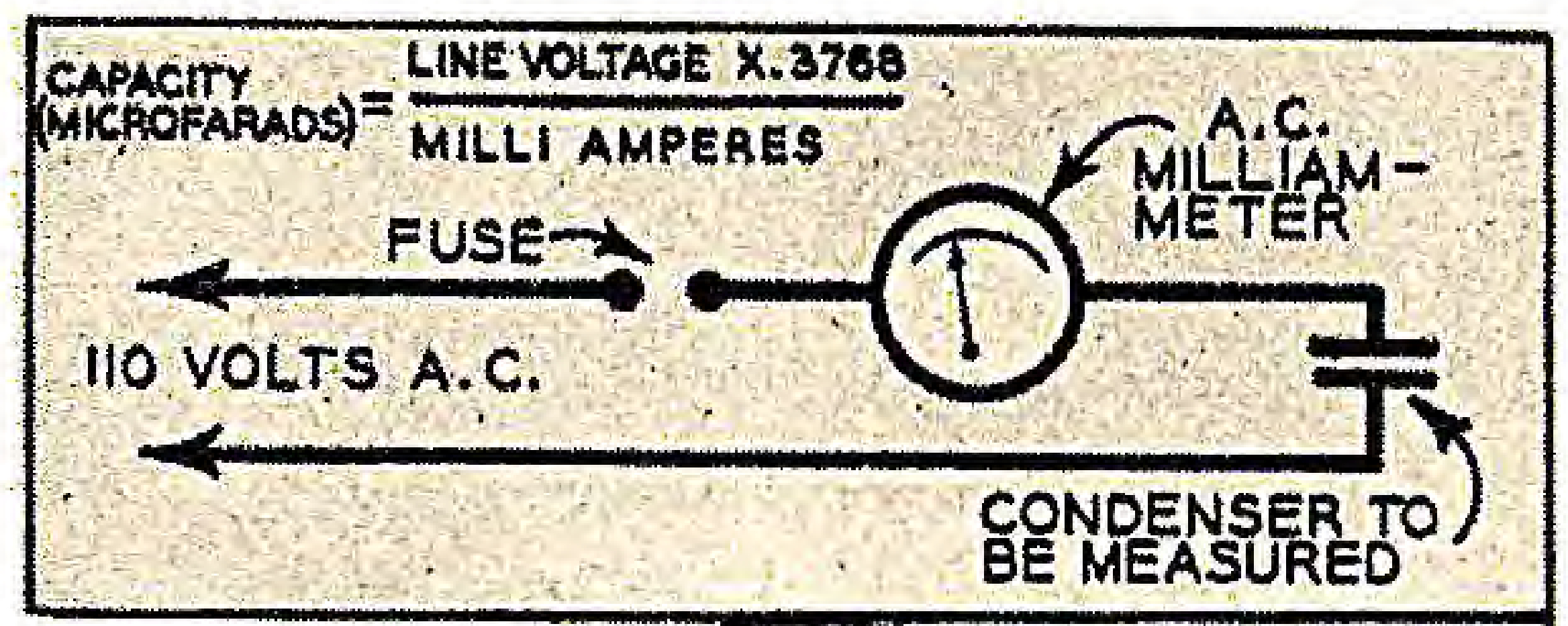
Power Rheostat Reduces Voltage Of A. C. Line

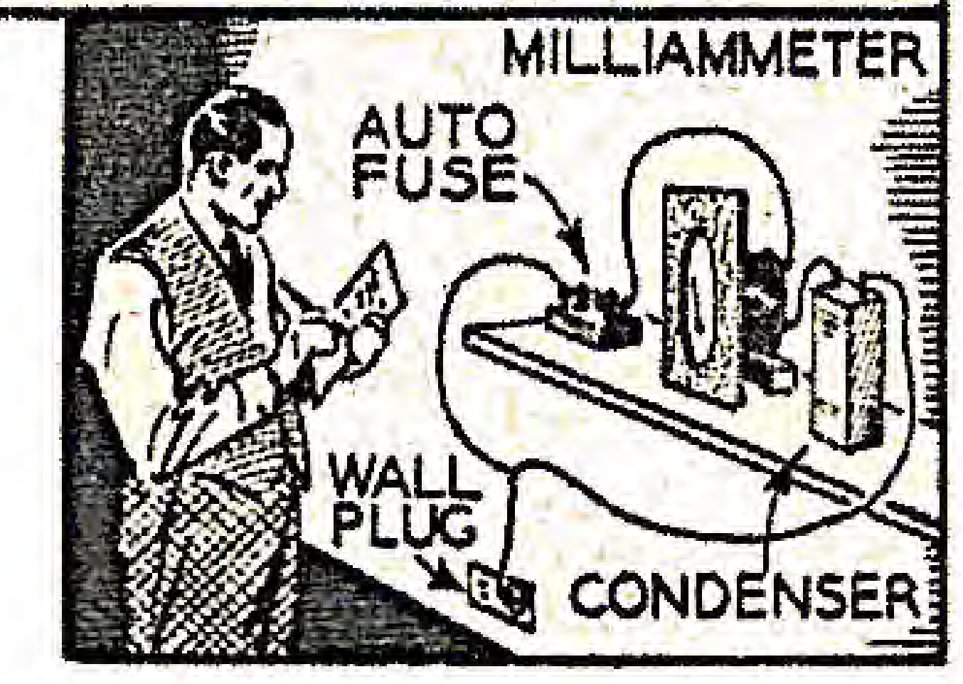

110 V. A.C.
SPINDLE
RADIO DIAL
TO VACUUM CLEANER
WOOD BLOCK
CORD
WOOD PANEL
METAL STRAPS
SALT WATER

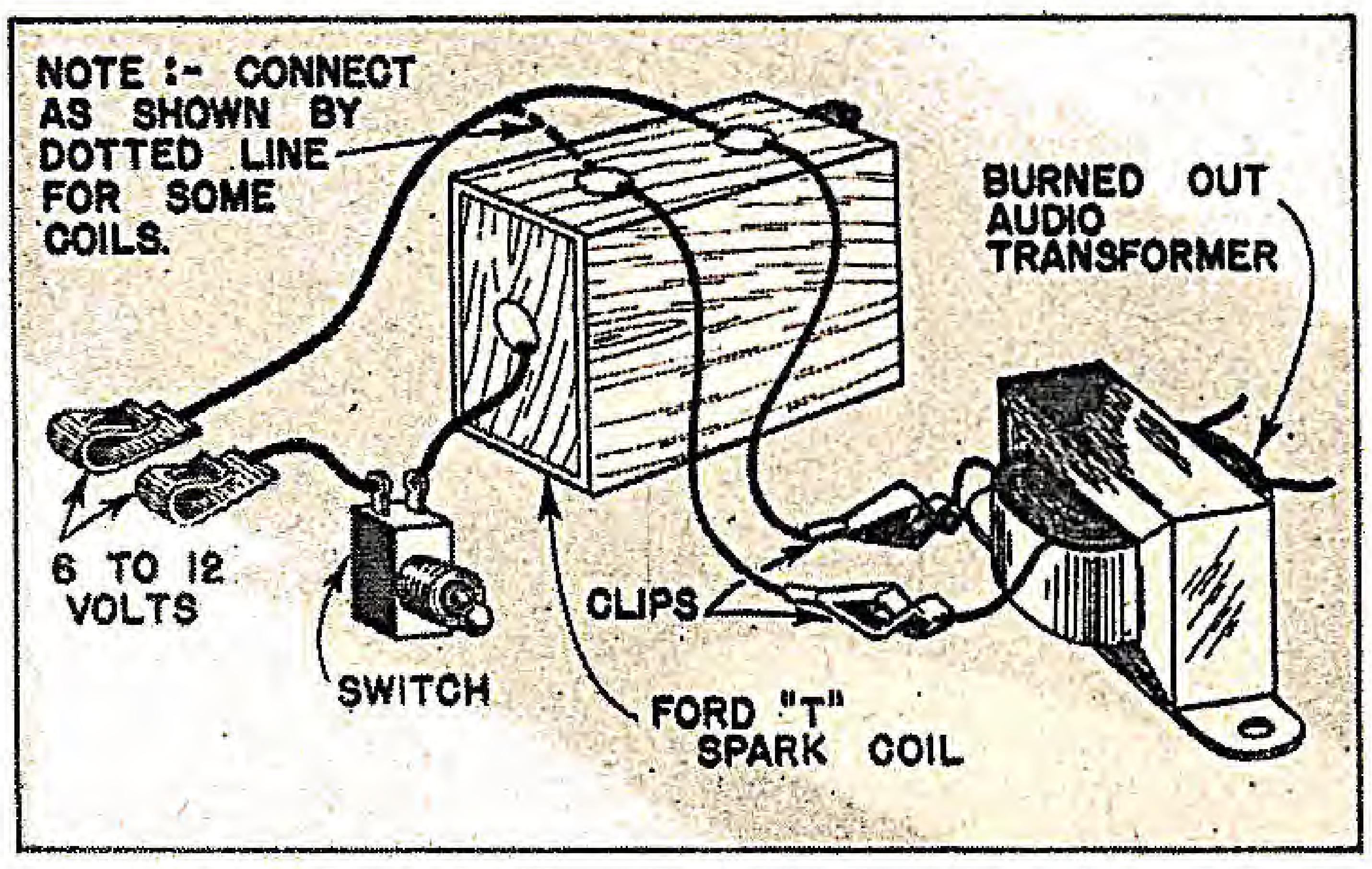
A SALT water rheostat has many uses about the radio or electrical experimenter's workbench. With it line voltage can be reduced gradually to zero, thus controlling vacuum cleaners, motors, and other electrical equipment. Mount two bars of any metal on a wood or bakelite block, and suspend them from the control dial shaft with strong cord. Under the bars set a container containing a concentrated salt solution. Turning the dial raises or lowers the bars, varying the immersion in solution, and thus controlling the current.

How To Measure Filter Condenser Capacities

NOTHING more than an A. C. milliammeter is needed to measure accurately the capacities of filter condensers. Connect the unknown condenser in series with the milliammeter across your 110 volt A. C. line. If line voltage is exactly 110 volts the milliammeter will be deflected, in direct proportion, 41.45 milliamperes per microfarad of capacity. The line voltage should be measured accurately with an A. C. voltmeter. For other voltages use the formula. The fuse protects the meter in case a shorted condenser is tested.


CAPACITY (MICROFARADS) = LINE VOLTAGE X.3768 / MILLI AMPERES
FUSE
A.C. MILLIAM-METER
110 VOLTS A.C.
CONDENSER TO BE MEASURED


MILLIAMMETER
AUTO FUSE
WALL PLUG
CONDENSER


NOTE :- CONNECT AS SHOWN BY DOTTED LINE FOR SOME COILS.
BURNED OUT AUDIO TRANSFORMER
6 TO 12 VOLTS
SWITCH
CLIPS
FORD "T" SPARK COIL

Spark Coil Repairs Burned Out Phones

BURNED out headphones, loudspeaker windings, or audio transformers can often be repaired simply by connecting across a model T Ford spark coil. Connect the high tension leads to the burned out winding, then connect the spark coil primary to either a 6 or 12 volt battery. The high voltage will jump the short break in the winding, and nine times out of ten fuse the two ends together.

Smallest ALL-ELECTRIC RADIO Has Only ONE TUBE

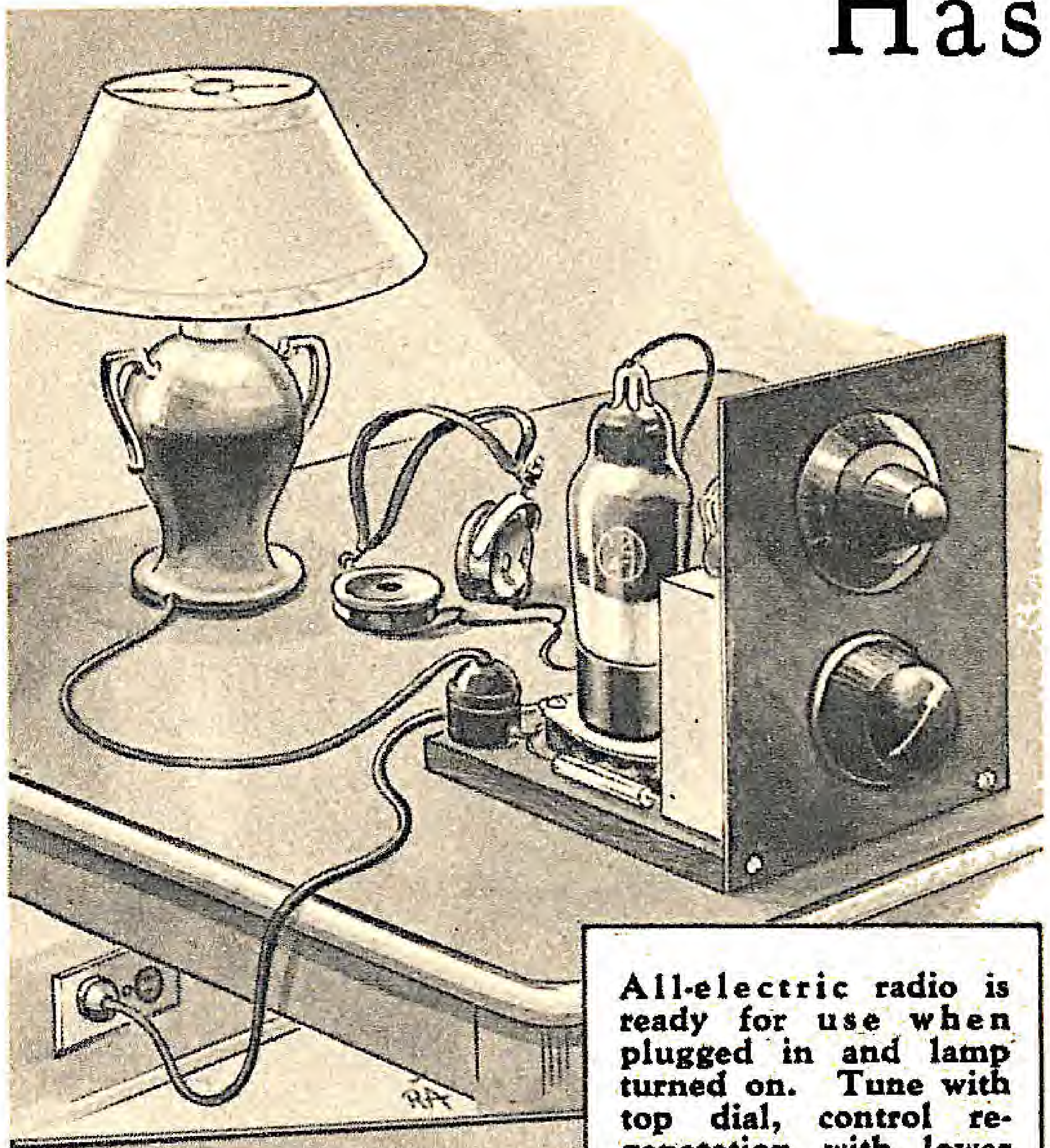
by T. A. BLANCHARD

HERE'S the world's smallest all-electric radio receiver—a one-tube set that is not a bit harder to build than an ordinary one-tube battery radio. Best of all, this little set will cover both the short wave and the broadcast bands, bringing in police calls, plane broadcasts, code and phone amateurs, and perhaps even a foreign station or two under good atmospheric conditions.

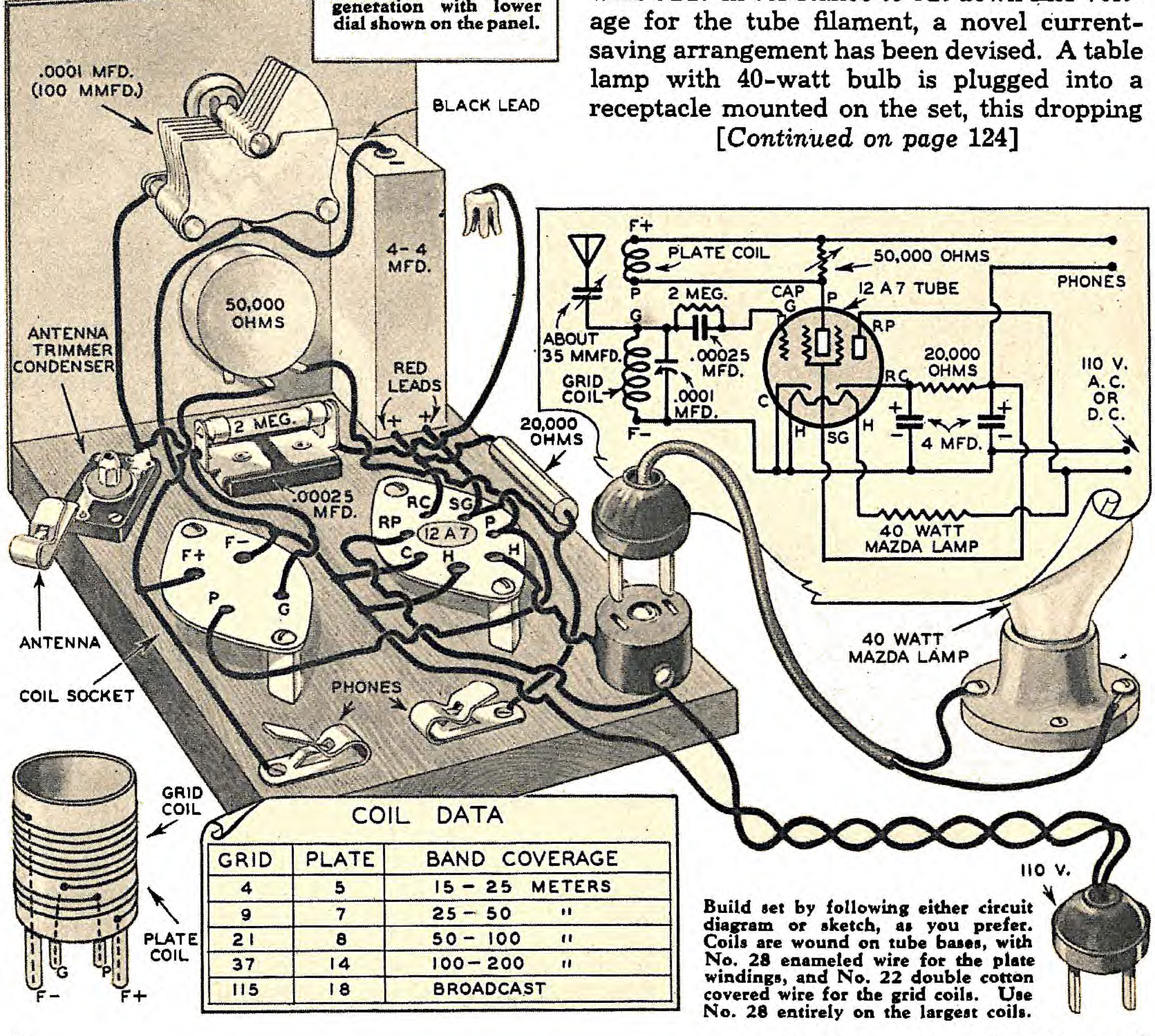
The secret of the success of this tiny set lies in the tube used—a dual purpose type labeled 12A7. One half of the tube is equivalent to a '38 pentode used as detector, and the other half a rectifier.

Instead of using an expensive special cord with built-in resistance to cut down line voltage for the tube filament, a novel current-saving arrangement has been devised. A table lamp with 40-watt bulb is plugged into a receptacle mounted on the set, this dropping

[Continued on page 124]



All-electric radio is ready for use when plugged in and lamp turned on. Tune with top dial, control regeneration with lower dial shown on the panel.

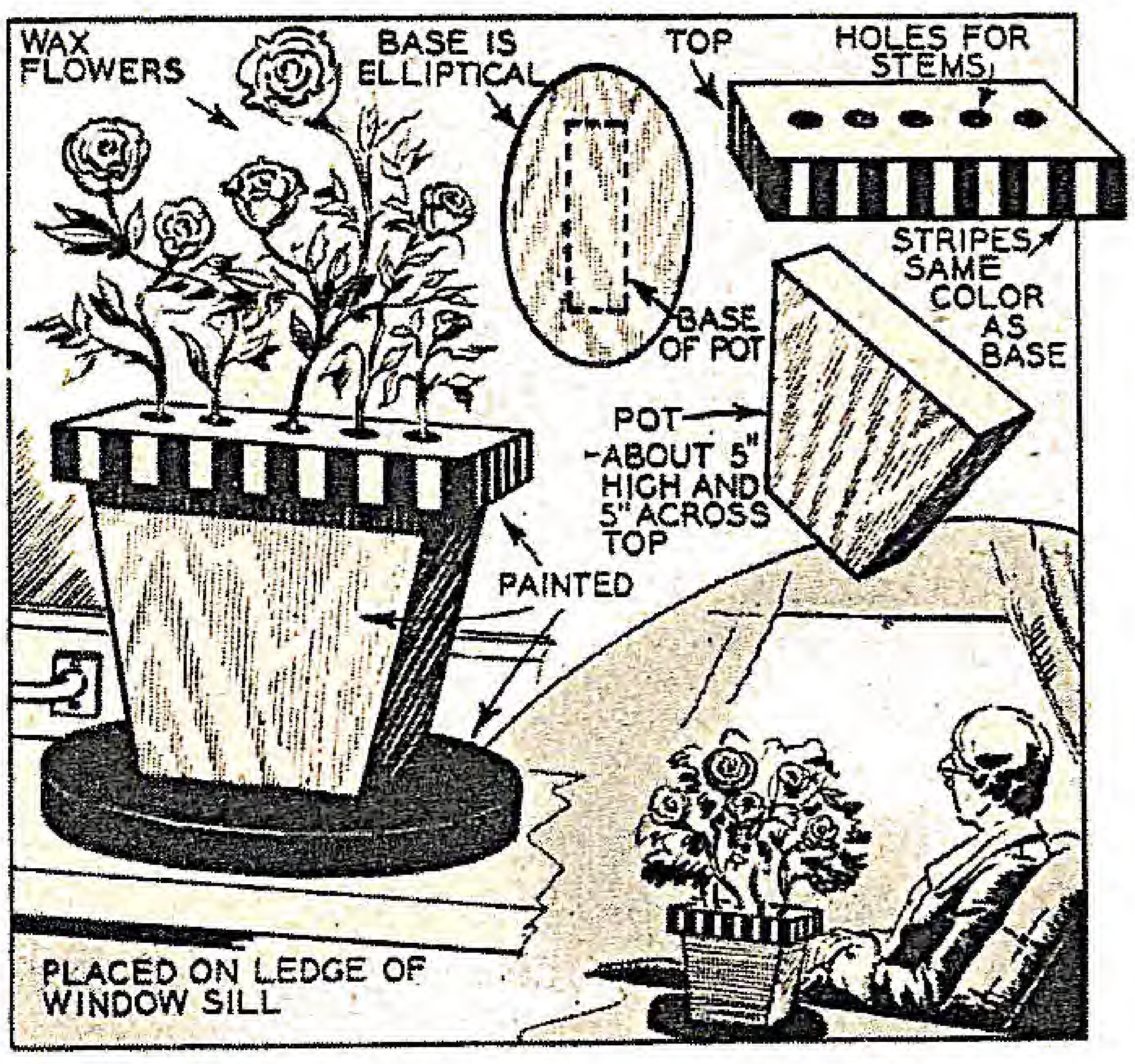

.0001 MFD. (100 MMFD.)
BLACK LEAD
4-4 MFD.
50,000 OHMS
ANTENNA TRIMMER CONDENSER
RED LEADS
+
+
2 MEG.
20,000 OHMS
.00025 MFD.
RC
SG
RP
12 A 7
P
C
H
H
F+
F-
P
G
ANTENNA
COIL SOCKET
PHONES
40 WATT MAZDA LAMP
GRID COIL
PLATE COIL
G
P
F-
F+
110 V.
F+
PLATE COIL
50,000 OHMS
P
2 MEG.
CAP
G
P
12 A 7 TUBE
PHONES
G
RP
ABOUT 35 MMFD.
GRID COIL
.00025 MFD.
.0001 MFD.
F-
20,000 OHMS
RC
C
H
SG
H
4 MFD.
110 V. A.C. OR D.C.
40 WATT MAZDA LAMP

COIL DATA

GRID	PLATE	BAND COVERAGE
4	5	15 - 25 METERS
9	7	25 - 50 "
21	8	50 - 100 "
37	14	100 - 200 "
115	18	BROADCAST

Build set by following either circuit diagram or sketch, as you prefer. Coils are wound on tube bases, with No. 28 enameled wire for the plate windings, and No. 22 double cotton covered wire for the grid coils. Use No. 28 entirely on the largest coils.

NOVEL HOME FURNISHINGS

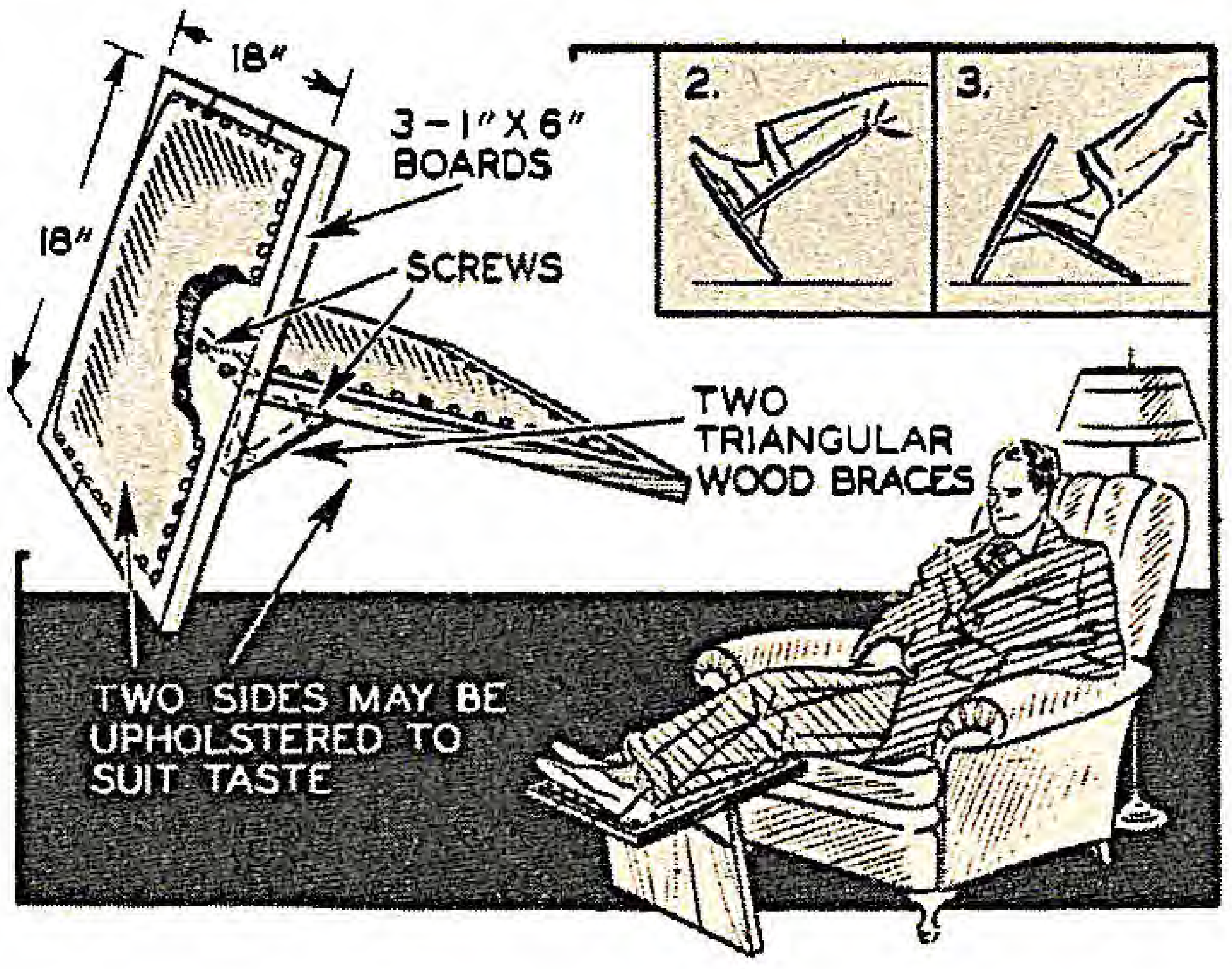

WAX FLOWERS
BASE IS ELLIPTICAL
TOP
HOLES FOR STEMS
STRIPES SAME COLOR AS BASE
BASE OF POT
POT—ABOUT 5" HIGH AND 5" ACROSS TOP
PAINTED
PLACED ON LEDGE OF WINDOW SILL

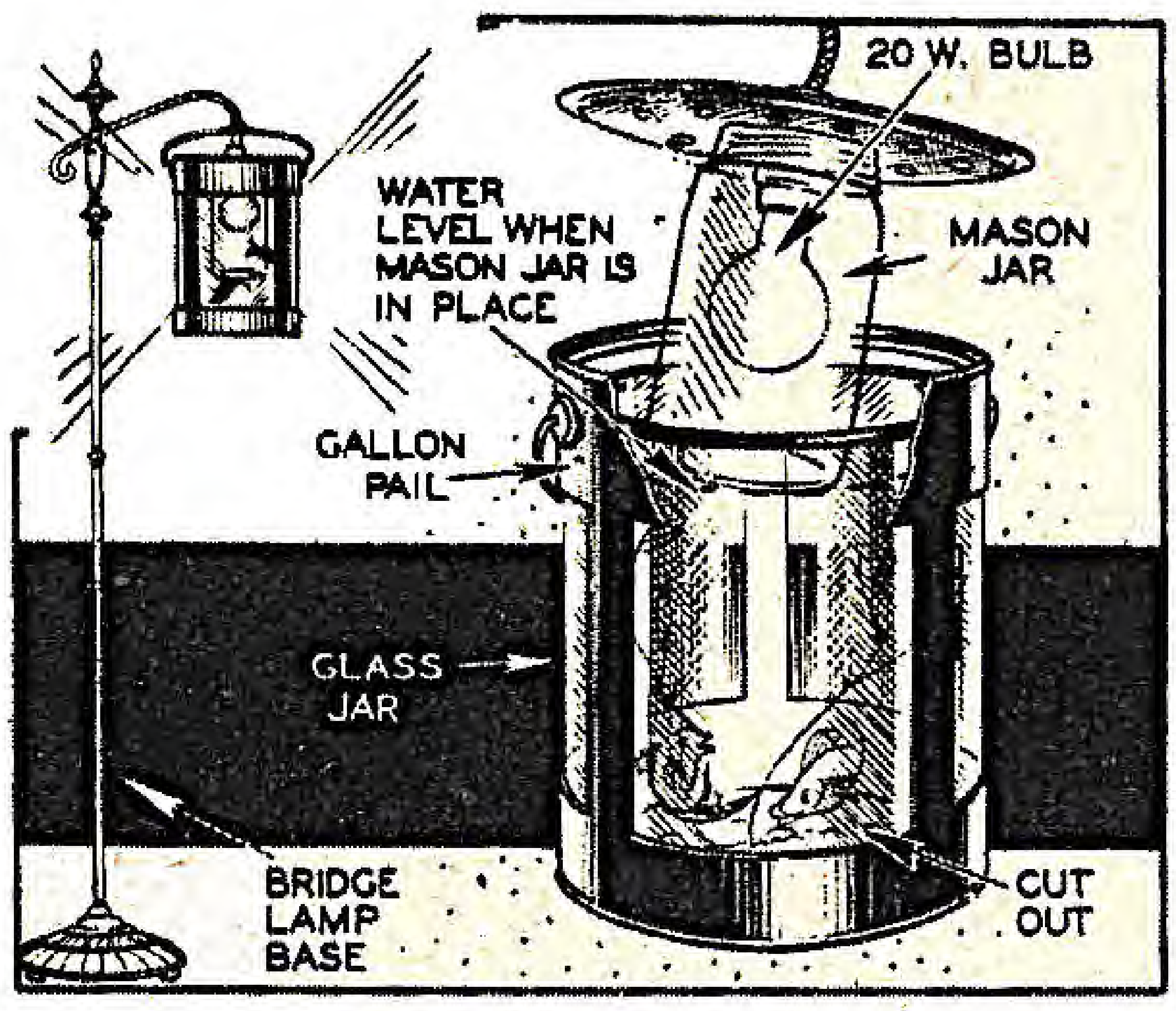
Wooden Pot Holds Artificial Flowers

IMITATION crockery flowerpots, when placed on a window ledge and filled with artificial flowers produce a startlingly realistic effect, yet do not break to spread dirt and crockery chips on the floor when accidentally knocked off as the window sash is raised. The flowerpot is cut about five inches high and five inches wide, and nailed to a 2"x4" base cut into an elliptical shape. A rectangular block is fastened to the top, and holes are drilled to hold the flower stems. When the project is finished, stripes of brightly colored enamel in contrasting colors are painted around the top. The base is painted a dark color.—Herbert W. Hahn.

Simple Foot Stool Provides Leg Rest

SIMPLE and easy to construct, a new foot stool which can be cut and assembled in less than a half an hour provides not only foot, but also leg rest. It is made by fastening together two pieces of one-inch board as shown in the sketches, each cut to a size of 18"x18". Use wood screws and angle brackets to make a rigid joint here. The foot rest is now completed with the exception of such covering or upholstery as may be thought necessary. When finished, it furnishes either a high or a low foot and leg rest as desired.—W. H. Leach.


18"
18"
3-1"X6" BOARDS
SCREWS
TWO TRIANGULAR WOOD BRACES
2.
3.
TWO SIDES MAY BE UPHOLSTERED TO SUIT TASTE

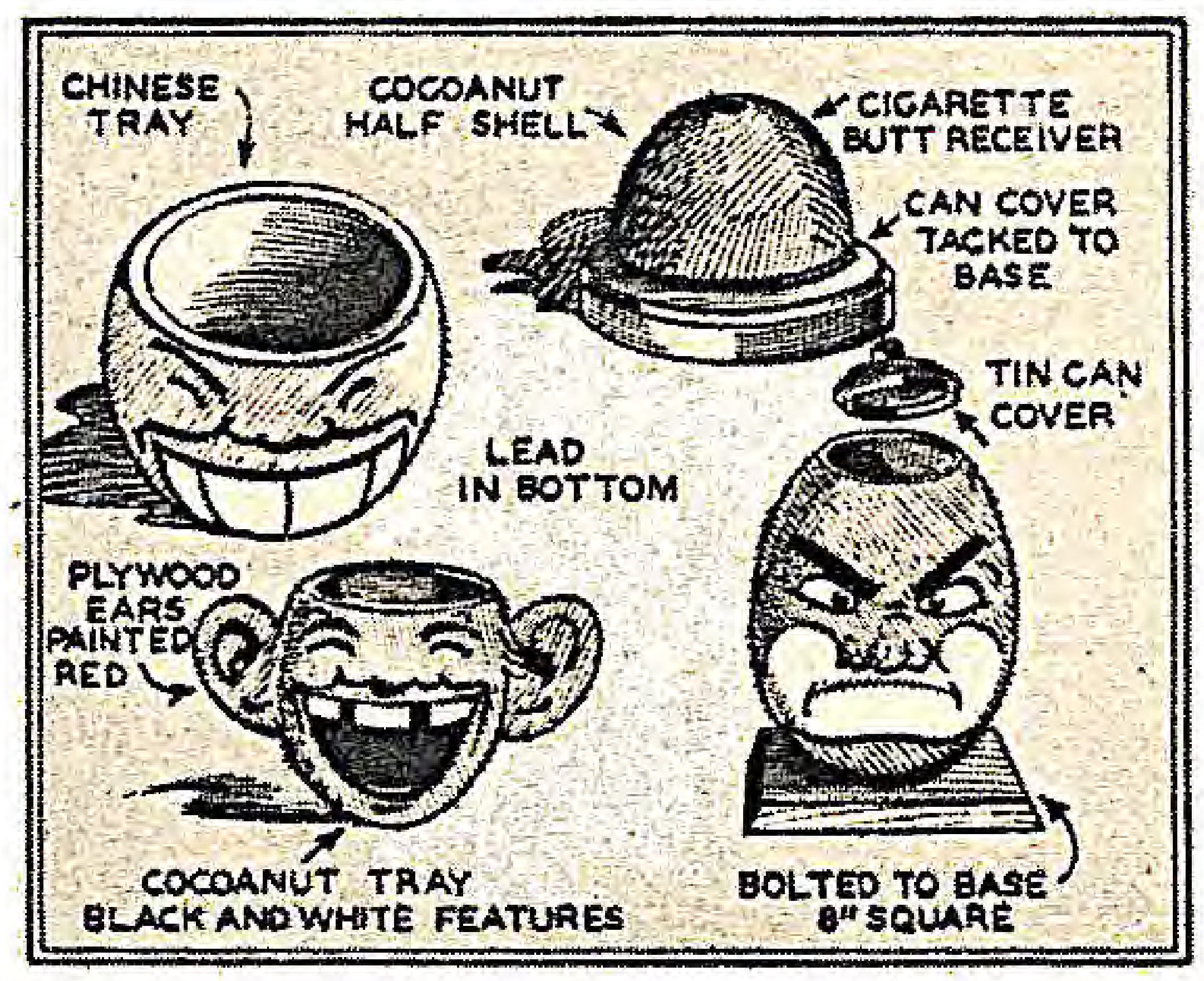

20 W. BULB
WATER LEVEL WHEN MASON JAR IS IN PLACE
MASON JAR
GALLON PAIL
GLASS JAR
BRIDGE LAMP BASE
CUT OUT

Swimming Fish Add to Beauty of Novel Lamp

SWIMMING fish, their colors beautifully brought out by an electric light, lend a novel effect to a decorative lamp constructed from an old gallon pail, two glass jars, an old bridge lamp stand, and an electric light. Using tin-snips, cut panels into an old gallon pail and place a wide-mouthed jar inside. Solder the cover of a pint mason jar to the pail cover, and mount an electric socket in the cover as shown. Place a 20-watt bulb in the pint jar. A larger bulb would overheat the water. Punch holes in the large cover to admit air to the aquarium.—Theodore Malleuge.

Painted Cocoanuts Make Comic Trays For Den

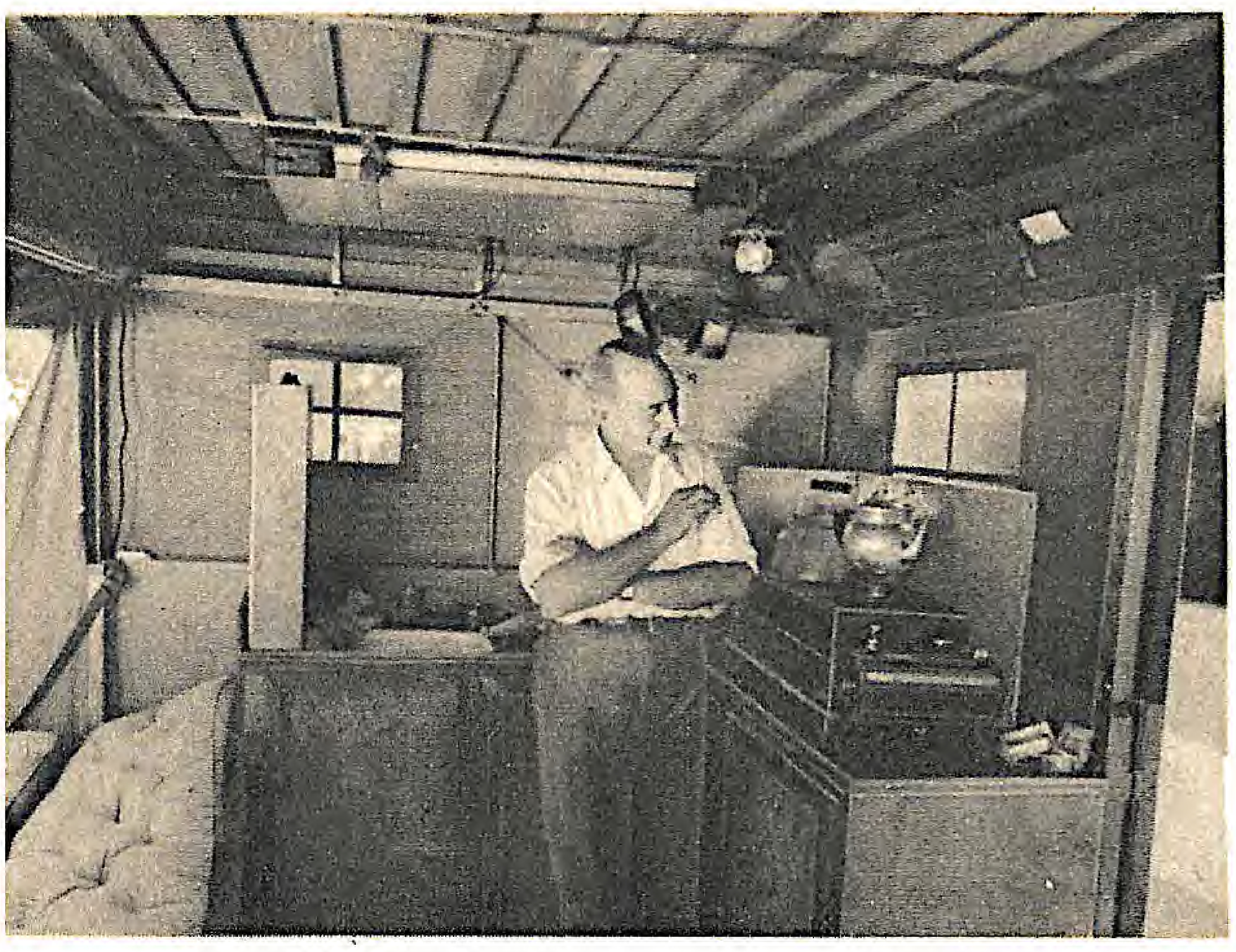
ASH trays, both gruesome and comic, provide novelty for the den at very little expense through the use of a little clever brush work on the rough exterior of a cocoanut shell. The features are first sketched onto the shells with pencil and then painted in with a camel's hair brush. Any variety of colors may be used. The trays may be leaded in the bottom or bolted to a base to provide stability. Plywood ears, painted red, add a comedy touch, and horsehair sideburns produce an oddly realistic effect. An inverted half shell makes a good cigarette butt receiver.—C. McKeon.


CHINESE TRAY
COCOANUT HALF SHELL
CIGARETTE BUTT RECEIVER
CAN COVER TACKED TO BASE
TIN CAN COVER
LEAD IN BOTTOM
PLYWOOD EARS PAINTED RED
COCOANUT TRAY BLACK AND WHITE FEATURES
BOLTED TO BASE 8" SQUARE

Build this MOVIE STAR'S

Cheap, light, easy to build, this is the trailer you have been looking for. Its collapsible top and outslung bunks reduce traveling costs and increase camping comforts of motorists.

PART I



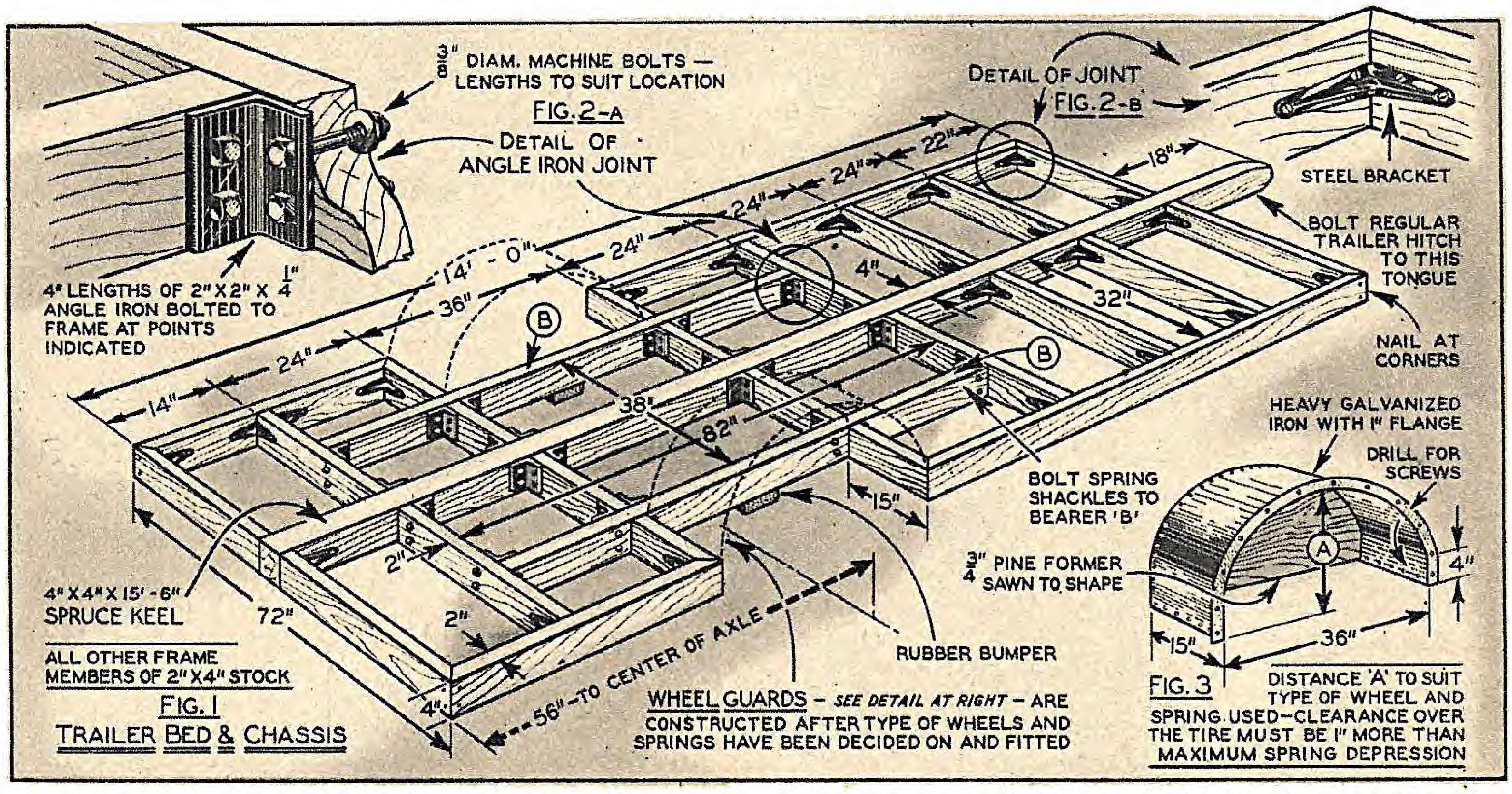
Here is the trim interior of Sir Guy Standing's trailer. On the sink at left is the portable water tank. Note folding table strapped to the roof. Pipes supporting roof and strengthening guy wires can be seen in rear.

NOMADS of the open road will hail with delight this trailer with the one-man collapsible top and the hanging bunks. It has everything! Designed and originated by Sir Guy Standing, movie star, it was built by California's leading auto trailer expert, Harry Brumpton of Los Angeles. It is so simple that the average man can build it. It is so light that it can go anywhere, yet it will stand up under severe usage.

The top lowers onto the bottom body by the simple expedient of fastening the roof frame to pipes, which slide down into larger pipes set in the body. To raise, merely lift the top, insert plugs, and the top is rigid, waterproof, and cool. Slack in canvas is taken up by merely adjusting the sliding pipes. In traveling, the top lowers onto the body, is fastened down with auto curtain fasteners, and you're ready to ramble.

The body frame is covered with pressed wood, which is durable and eliminates "road rumble." The windows of the trailer are celluloid squares buttoned against mosquito netting, and in addition a skylight provides illumination. By hanging the bunks outside, maximum floor space is obtained and extra ventilation afforded. Those are highlights of the trailer; now to roll up our sleeves and make it.

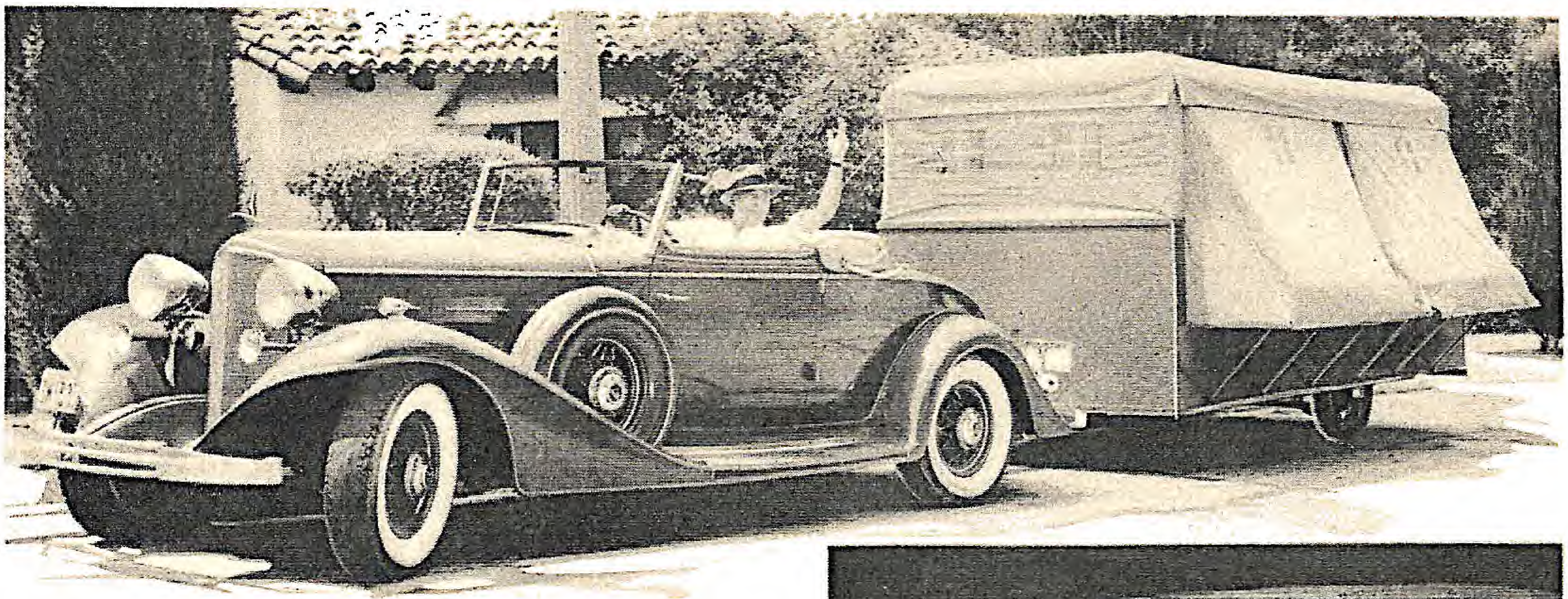
First take a selected 4x4 spruce, 15½′ long,


⅜" DIAM. MACHINE BOLTS — LENGTHS TO SUIT LOCATION
FIG. 2-A
DETAIL OF ANGLE IRON JOINT
4" LENGTHS OF 2"X2"X ¼" ANGLE IRON BOLTED TO FRAME AT POINTS INDICATED
DETAIL OF JOINT
FIG. 2-B
STEEL BRACKET
BOLT REGULAR TRAILER HITCH TO THIS TONGUE
NAIL AT CORNERS
14'-0"
24"
24"
24"
22"
18"
36"
24"
14"
4"
32"
38"
82"
15"
B
B
BOLT SPRING SHACKLES TO BEARER 'B'
HEAVY GALVANIZED IRON WITH 1" FLANGE
DRILL FOR SCREWS
¾" PINE FORMER SAWN TO SHAPE
A
4"
15"
36"
4"X4"X15'-6" SPRUCE KEEL
72"
2"
2"
4"
56"-TO CENTER OF AXLE
RUBBER BUMPER
ALL OTHER FRAME MEMBERS OF 2"X4" STOCK
FIG. 1
TRAILER BED & CHASSIS
WHEEL GUARDS - SEE DETAIL AT RIGHT - ARE CONSTRUCTED AFTER TYPE OF WHEELS AND SPRINGS HAVE BEEN DECIDED ON AND FITTED
FIG. 3
DISTANCE 'A' TO SUIT TYPE OF WHEEL AND SPRING USED—CLEARANCE OVER THE TIRE MUST BE 1" MORE THAN MAXIMUM SPRING DEPRESSION

Complete details of the trailer foundation are shown above. Running gear available to the builder is attached to the bearers marked B. Flooring, laid diagonally over the frame, helps to strengthen it. Angle irons and brackets also brace it.

Collapsible TRAILER

by JACK SMALLEY



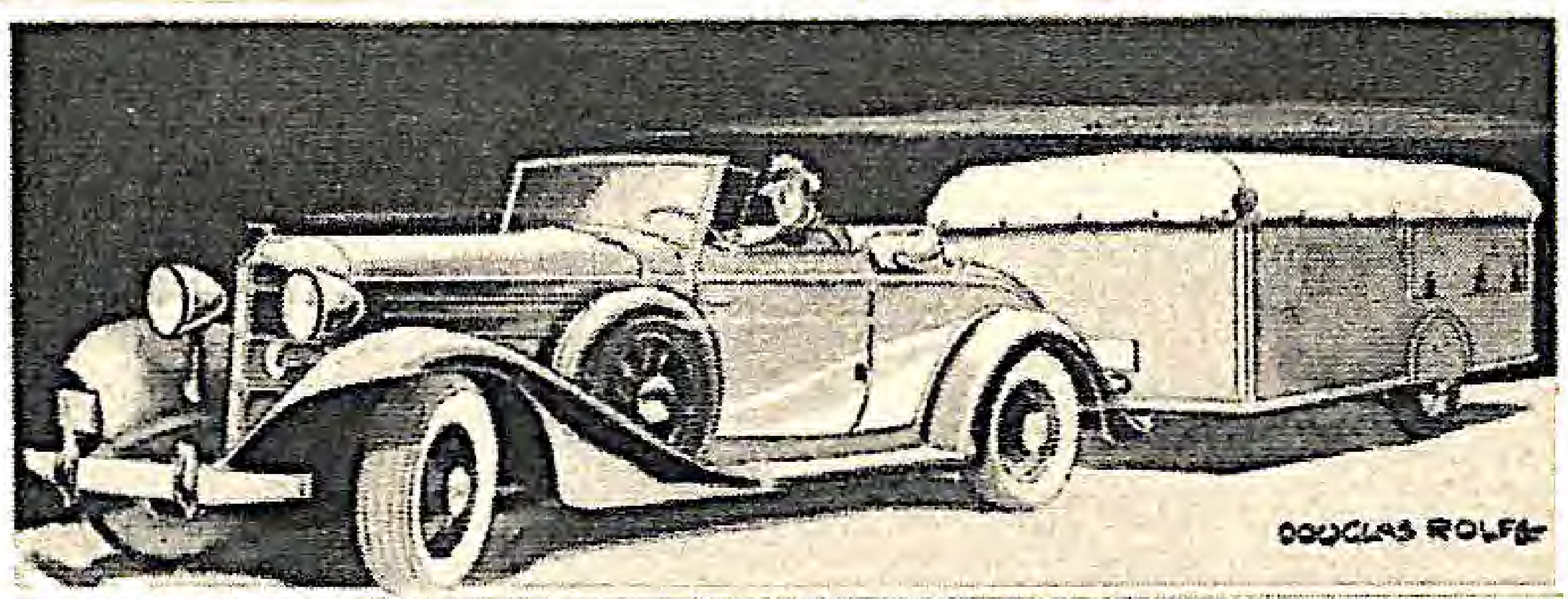
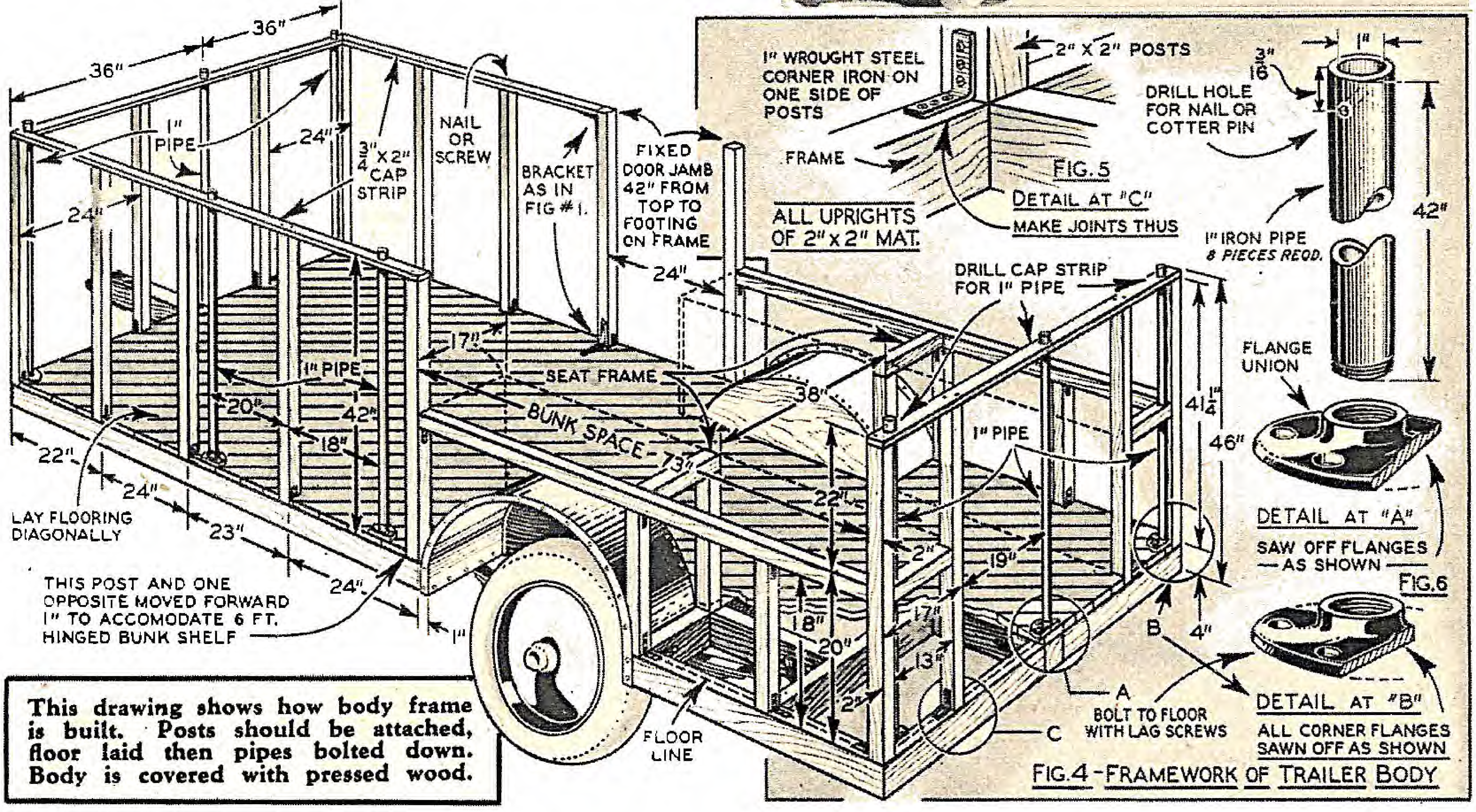

DOUGLAS ROLFE

Photo above shows Sir Guy Standing, movie star, and trailer he designed. It shows the roof raised and bunks swung out. Trailer described here is modeled after Sir Guy Standing's trailer. Right—Drawing shows trailer with top down and bunk folded. This trailer has only one bunk on left side.


36"
36"
1" PIPE
24"
24"
3/4"x2" CAP STRIP
NAIL OR SCREW
BRACKET AS IN FIG #1.
FIXED DOOR JAMB 42" FROM TOP TO FOOTING ON FRAME
24"
17"
1" PIPE
SEAT FRAME
20"
42"
18"
BUNK SPACE 73"
38"
22"
22"
24"
23"
24"
1"
LAY FLOORING DIAGONALLY
THIS POST AND ONE OPPOSITE MOVED FORWARD 1" TO ACCOMODATE 6 FT. HINGED BUNK SHELF
FLOOR LINE
18"
20"
2"
17"
13"
2"
19"
1" PIPE
41 1/4"
46"
4"
A
BOLT TO FLOOR WITH LAG SCREWS
B
C
DRILL CAP STRIP FOR 1" PIPE
1" WROUGHT STEEL CORNER IRON ON ONE SIDE OF POSTS
2" X 2" POSTS
FRAME
FIG. 5
DETAIL AT "C"
MAKE JOINTS THUS
ALL UPRIGHTS OF 2"x2" MAT.
1"
3/16"
DRILL HOLE FOR NAIL OR COTTER PIN
42"
1" IRON PIPE 8 PIECES REQD.
FLANGE UNION
DETAIL AT "A"
SAW OFF FLANGES AS SHOWN
FIG.6
DETAIL AT "B"
ALL CORNER FLANGES SAWN OFF AS SHOWN

This drawing shows how body frame is built. Posts should be attached, floor laid then pipes bolted down. Body is covered with pressed wood.

FIG.4-FRAMEWORK OF TRAILER BODY

for the keel. This projects 1½′ and provides the tongue, on which you later fasten a regulation trailer hitch.

A 2″x4″ frame is then constructed and attached to the keel to form the trailer bed or foundation which is 14 feet long by 6 feet wide. The keel and frame members are braced as shown in Fig. 1 by means of pieces of angle iron and steel brackets.

By studying Fig. 1 it will be seen that the angle iron braces are used only to strengthen the truss about the spring bearers. Fig 2A shows a typical joint. All remaining joints are strengthened with steel brackets (Fig. 2B). With the diagonally laid flooring in place, as shown in Fig. 4, this construction will be found sufficiently strong and rigid to carry any running gear.

Now is the time to decide upon the wheels and springs you intend to employ. Measurements and details of the running gear are omitted since everyone has his own ideas on the subject and in any case the fittings will depend upon the type of wheels and springs

This Roomy Trailer Has Two Bunks and Compact Interior Furnishings

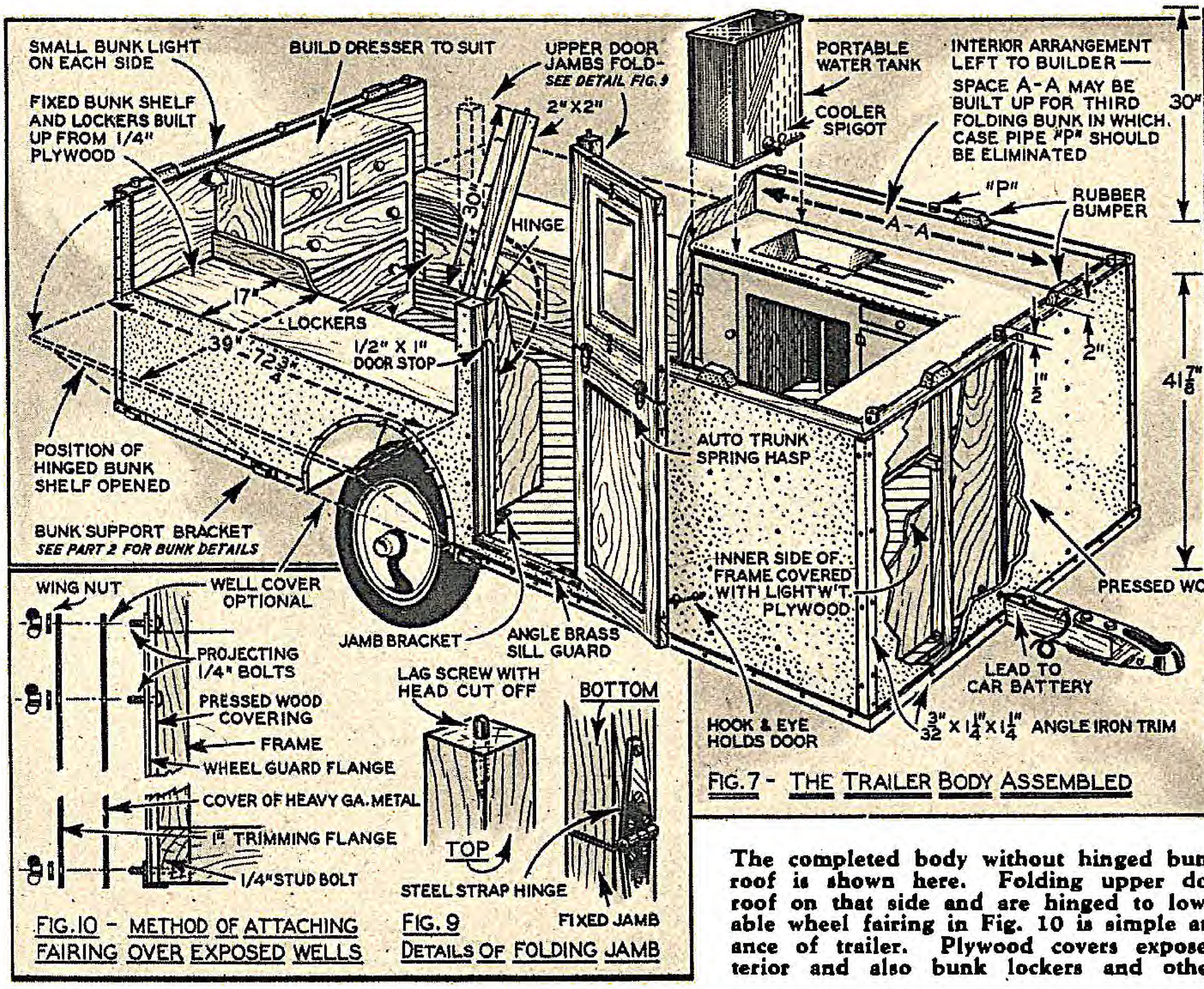

SMALL BUNK LIGHT ON EACH SIDE
BUILD DRESSER TO SUIT
UPPER DOOR JAMBS FOLD– SEE DETAIL FIG. 9
2"X2"
FIXED BUNK SHELF AND LOCKERS BUILT UP FROM 1/4" PLYWOOD
HINGE
30"
17"
LOCKERS
39"
72 3/4"
1/2" X 1" DOOR STOP
POSITION OF HINGED BUNK SHELF OPENED
BUNK SUPPORT BRACKET SEE PART 2 FOR BUNK DETAILS
PORTABLE WATER TANK
COOLER SPIGOT
INTERIOR ARRANGEMENT LEFT TO BUILDER — SPACE A-A MAY BE BUILT UP FOR THIRD FOLDING BUNK IN WHICH CASE PIPE "P" SHOULD BE ELIMINATED
"P"
A-A
RUBBER BUMPER
2"
1"/2
AUTO TRUNK SPRING HASP
INNER SIDE OF FRAME COVERED WITH LIGHT WT. PLYWOOD
PRESSED WOOD
LEAD TO CAR BATTERY
HOOK & EYE HOLDS DOOR
3/32" x 1 1/4" x 1 1/4" ANGLE IRON TRIM
JAMB BRACKET
ANGLE BRASS SILL GUARD
WING NUT
WELL COVER OPTIONAL
PROJECTING 1/4" BOLTS
PRESSED WOOD COVERING
FRAME
WHEEL GUARD FLANGE
COVER OF HEAVY GA. METAL
1" TRIMMING FLANGE
1/4" STUD BOLT
LAG SCREW WITH HEAD CUT OFF
BOTTOM
TOP
STEEL STRAP HINGE
FIXED JAMB

FIG. 7 - THE TRAILER BODY ASSEMBLED

FIG. 10 - METHOD OF ATTACHING FAIRING OVER EXPOSED WELLS

FIG. 9 DETAILS OF FOLDING JAMB

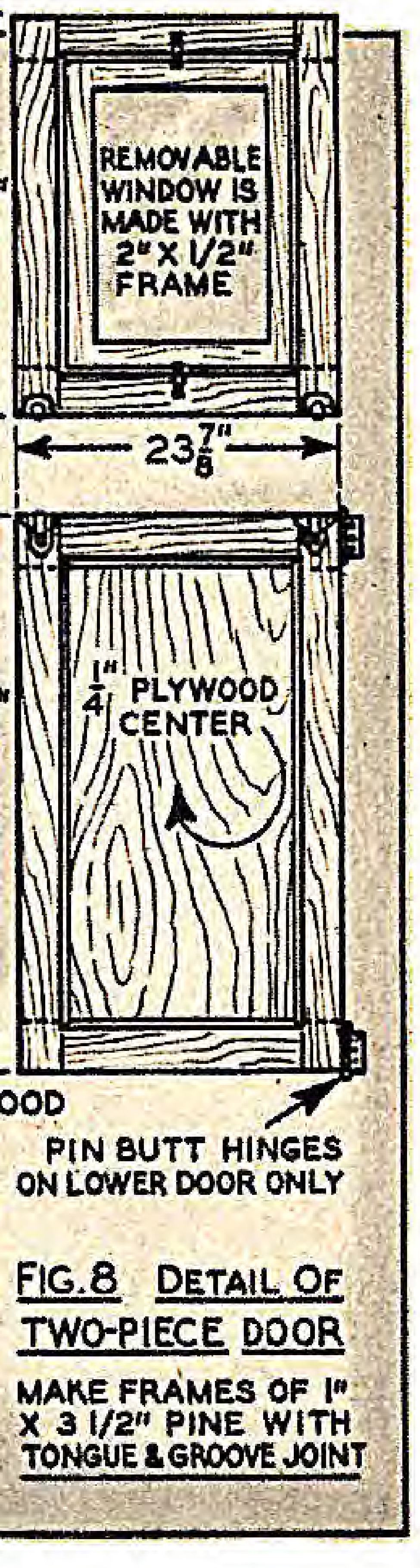

30"
REMOVABLE WINDOW IS MADE WITH 2" X 1/2" FRAME
23 7/8"
41 7/8"
1/4" PLYWOOD CENTER
PIN BUTT HINGES ON LOWER DOOR ONLY

FIG. 8 DETAIL OF TWO-PIECE DOOR

MAKE FRAMES OF 1" X 3 1/2" PINE WITH TONGUE & GROOVE JOINT

The completed body without hinged bunks and collapsible roof is shown here. Folding upper door jambs support roof on that side and are hinged to lower jamb. Detachable wheel fairing in Fig. 10 is simple and adds to appearance of trailer. Plywood covers exposed portions of interior and also bunk lockers and other interior details.

used. Sir Guy's trailer is rigged with Ford V-8 wheels but the bearers are long enough to take almost any standard spring assembly. This being so, select and fit your running gear taking care to align it correctly with the frame as the "roadability" of your trailer is intimately associated with this important item.

With wheels in place on the bare frame the wheel guards can be figured and fastened in place. The guard is simply galvanized iron curved over a piece of ¾" pine which has previously been cut to the proper shape. (Fig. 3.) The completed guards are screwed in place to the frame and we are now ready to lay the floor and proceed with the body frame.

The body frame is made of 2"x2" spruce which is later covered with pressed wood on the outside and, where desirable, with plywood inside. Pressed wood at 7 cents a square foot is a cheap covering, wears like iron, and is not only easy for an amateur to apply, but further serves to stiffen the whole body.

The body stands 3½ feet high above the bed or foundation and is about half the height of the trailer with top raised. Fig. 4 shows the simple sturdy construction of the body frame. The 2"x2" uprights are set at the intervals dimensioned in Fig. 4 and, with few exceptions, coincide with the cross-members of the bed. Two uprights are moved forward one inch to accommodate the hinged bunk flap which is dealt with later on in this article. Also note that the door jambs are spaced slightly wider than the other posts. This is to accommodate the 24-inch door.

Sir Guy Standing uses three bunks but the average persons' needs are amply served by two and so the drawings are laid out to accommodate two wide bunks and no more. If you desire a third bunk it is easily fitted by duplicating the bunk frame construction shown in Fig. 4 and locating it in line with and just ahead of the left bunk frame. Naturally this would have to be done at the time the body frame is built.

To continue, set the uprights in place and anchor to the bed with 1" angle irons, obtainable at any hardware store (see Fig. 5). One iron to each post is specified but if you feel more irons are needed by all means use them. Note that the uprights forming the lower door jamb are ¾" higher than the other full length posts. This is because we will later add two hinged upper jambs which rest

[*Continued on page* 128]

Weatherbeaten Wagon Wheel Lends Charm to Rustic Gate

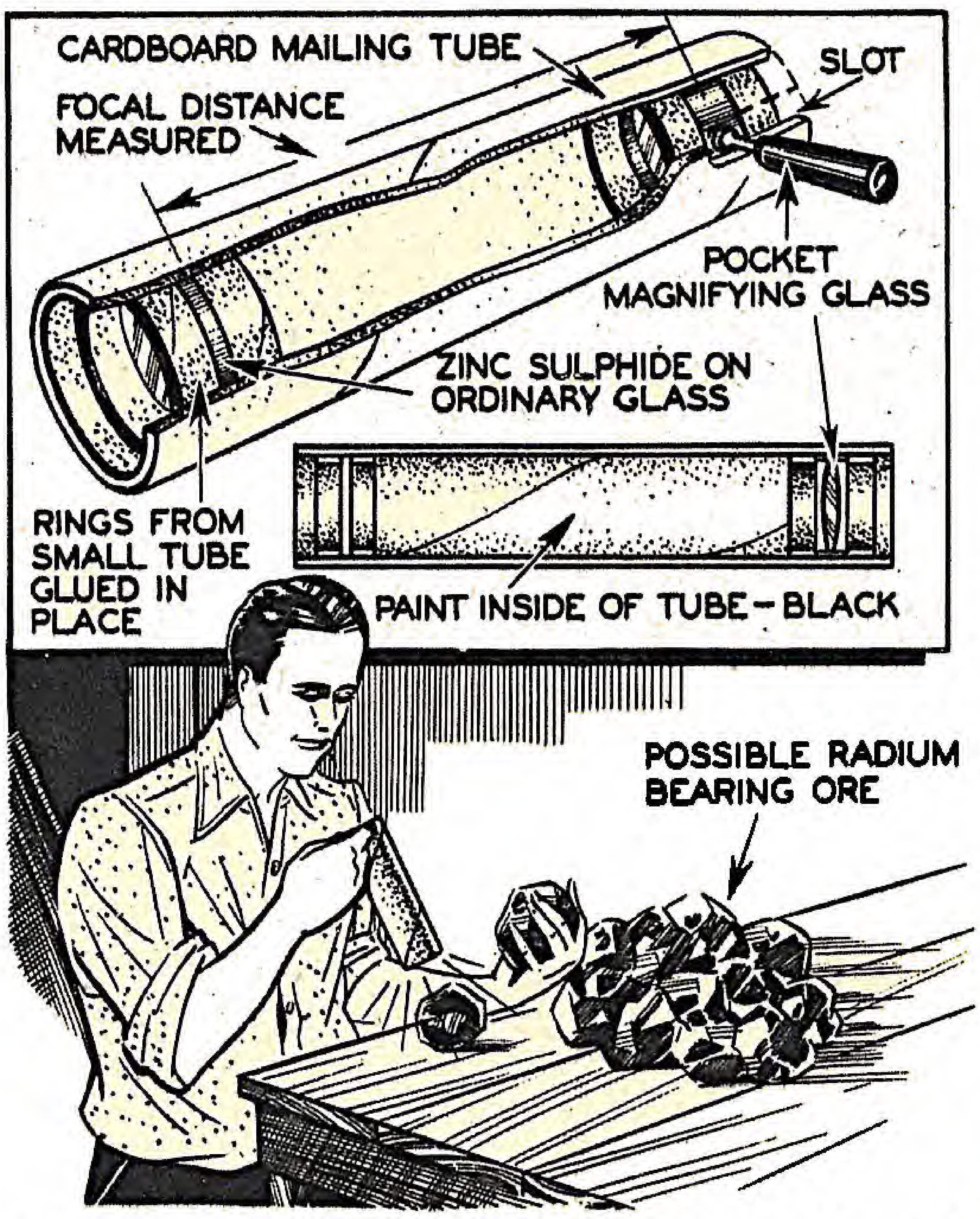
A WORN, weatherbeaten wagon wheel, reminiscent of the old covered-wagon days, can be made into a very attractive gate for small homes and bungalows with very little work.

Old wheels can be obtained on the junk heap of any farm, lying, splintered and unpainted, a relic of bygone days. No changes need be made; the age of the wheel adds to the rustic simplicity of the gate.

Using a conventional door hinge, the wheel is swung from a six-by-six post sunk next to the entry. It is supported on the top by sash cord or quarter-inch rope fastened to the top of the post.

Swung on a hinge and supported by a sash cord, a splintered old wagon wheel makes a distinctive, attractive, rustic gate.

Find Radium With Simple Detector

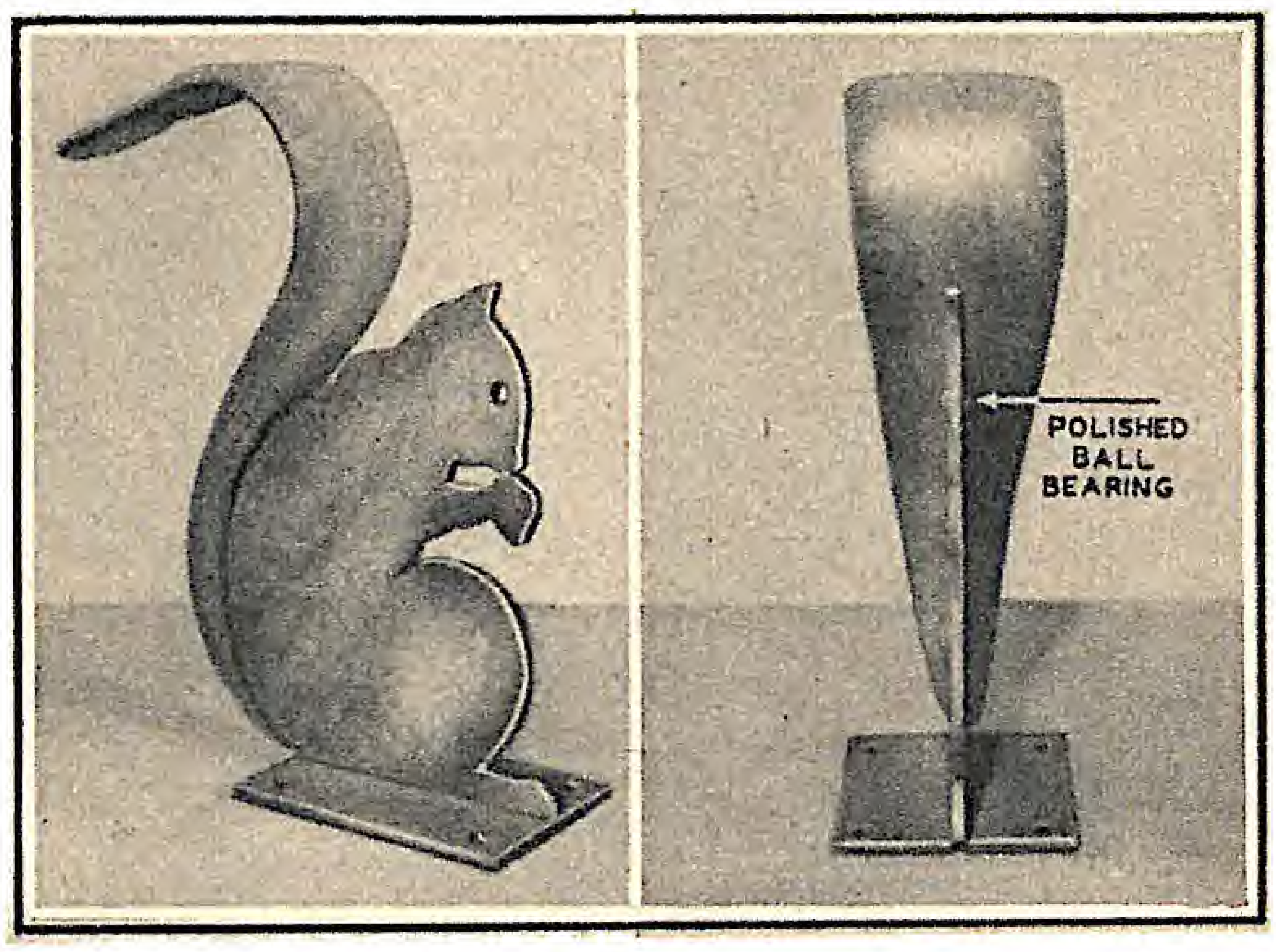

CARDBOARD MAILING TUBE
SLOT
FOCAL DISTANCE MEASURED
POCKET MAGNIFYING GLASS
ZINC SULPHIDE ON ORDINARY GLASS
RINGS FROM SMALL TUBE GLUED IN PLACE
PAINT INSIDE OF TUBE - BLACK
POSSIBLE RADIUM BEARING ORE

Zinc sulphide, sprinkled over adhesive on window glass end, glows when held over radium bearing ore in a dark chamber.

A SPINTHARISCOPE, a device for detecting the presence of valuable radium in ore, can be easily constructed from a pocket magnifying glass, two cardboard mailing tubes, and a sheet of ordinary window glass. The magnifying glass is set into one end of the large mailing tube and held there by two sections of the smaller tube, glued on the inside of the larger tube to form a firm setting. The interior of the tube is black, and a circle of glass is inserted at a proper focal distance from magnifying glass.

Steel Balls Make Realistic Eyes

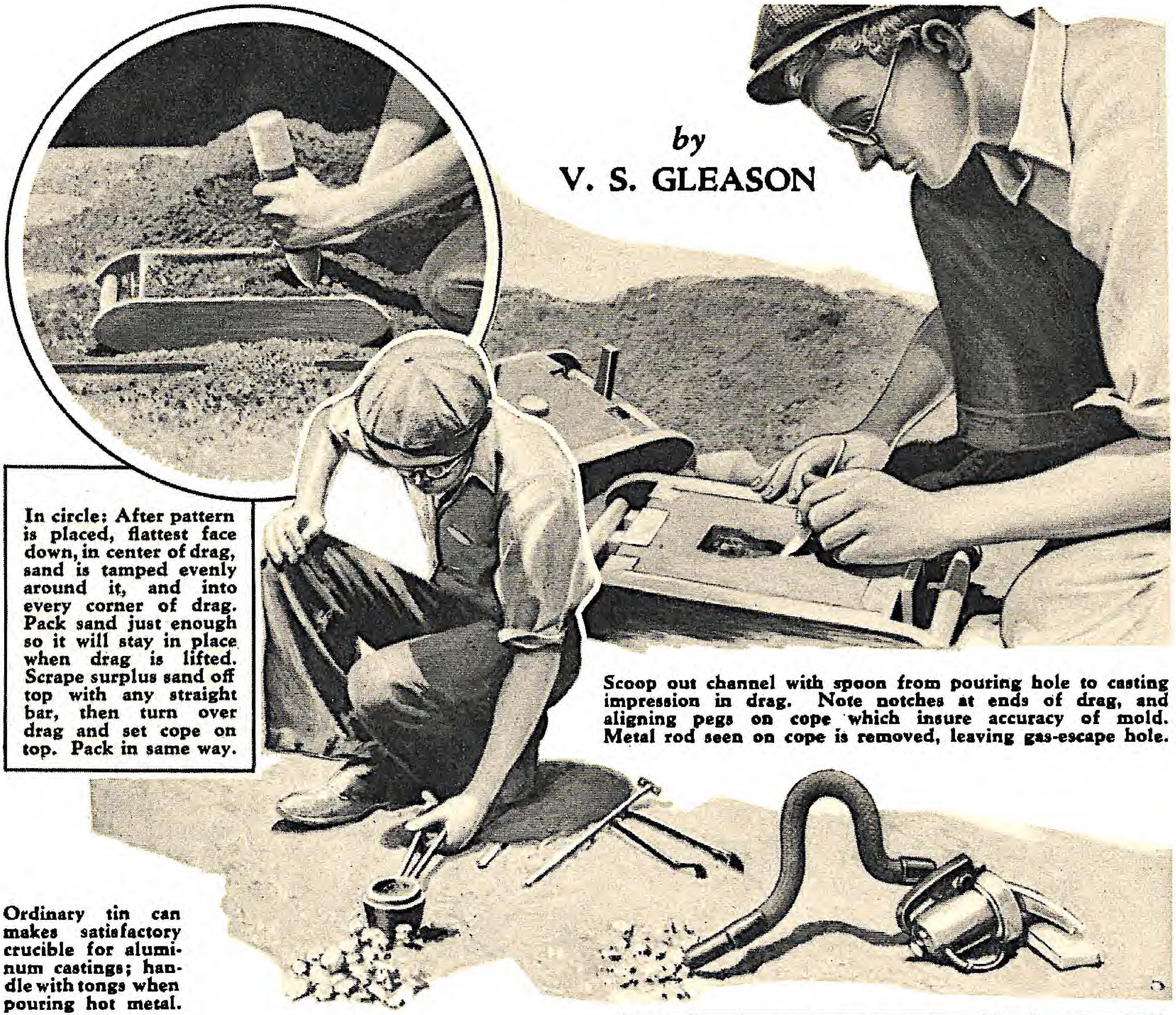
REALISTIC eyes may be easily added to novelty animal cut-outs by inserting polished steel ball-bearing into the eye sockets where they gleam in light to produce an amazingly like-life appearance. In figures cut from sheet metal, one bearing will serve for both eyes, protruding from each side when placed into the hole made for their insertion. In thick wooden figures, two bearings may be set into sockets drilled on either side of the head. Used in wood, the balls may be either glued or shellaced; in metal, they are held in place by small wooden pegs.



Left—A side view of metal squirrel showing life-like bearing eyes. Right—As the same cut-out looks from the front.

"Hole-in-Ground" Furnace Makes Castings

by
V. S. GLEASON



In circle: After pattern is placed, flattest face down, in center of drag, sand is tamped evenly around it, and into every corner of drag. Pack sand just enough so it will stay in place when drag is lifted. Scrape surplus sand off top with any straight bar, then turn over drag and set cope on top. Pack in same way.

Scoop out channel with spoon from pouring hole to casting impression in drag. Note notches at ends of drag, and aligning pegs on cope which insure accuracy of mold. Metal rod seen on cope is removed, leaving gas-escape hole.

Ordinary tin can makes satisfactory crucible for aluminum castings; handle with tongs when pouring hot metal.

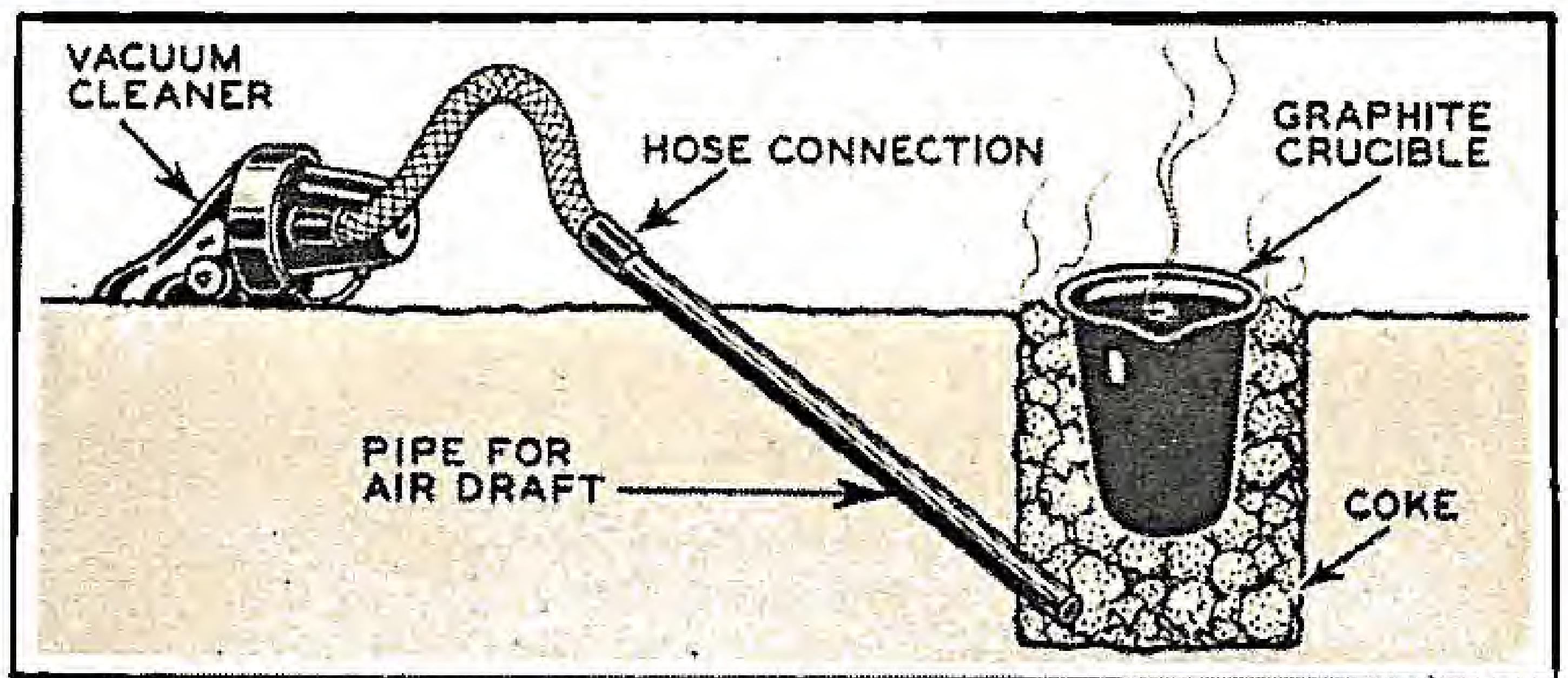
BRASS, bronze, or aluminum castings for model projects or even larger work can be made in your own "hole-in-the-ground" foundry at a cost of no more than one cent each—castings so accurate, so smooth that they are ready for use after only a few minutes on the buffing wheel.

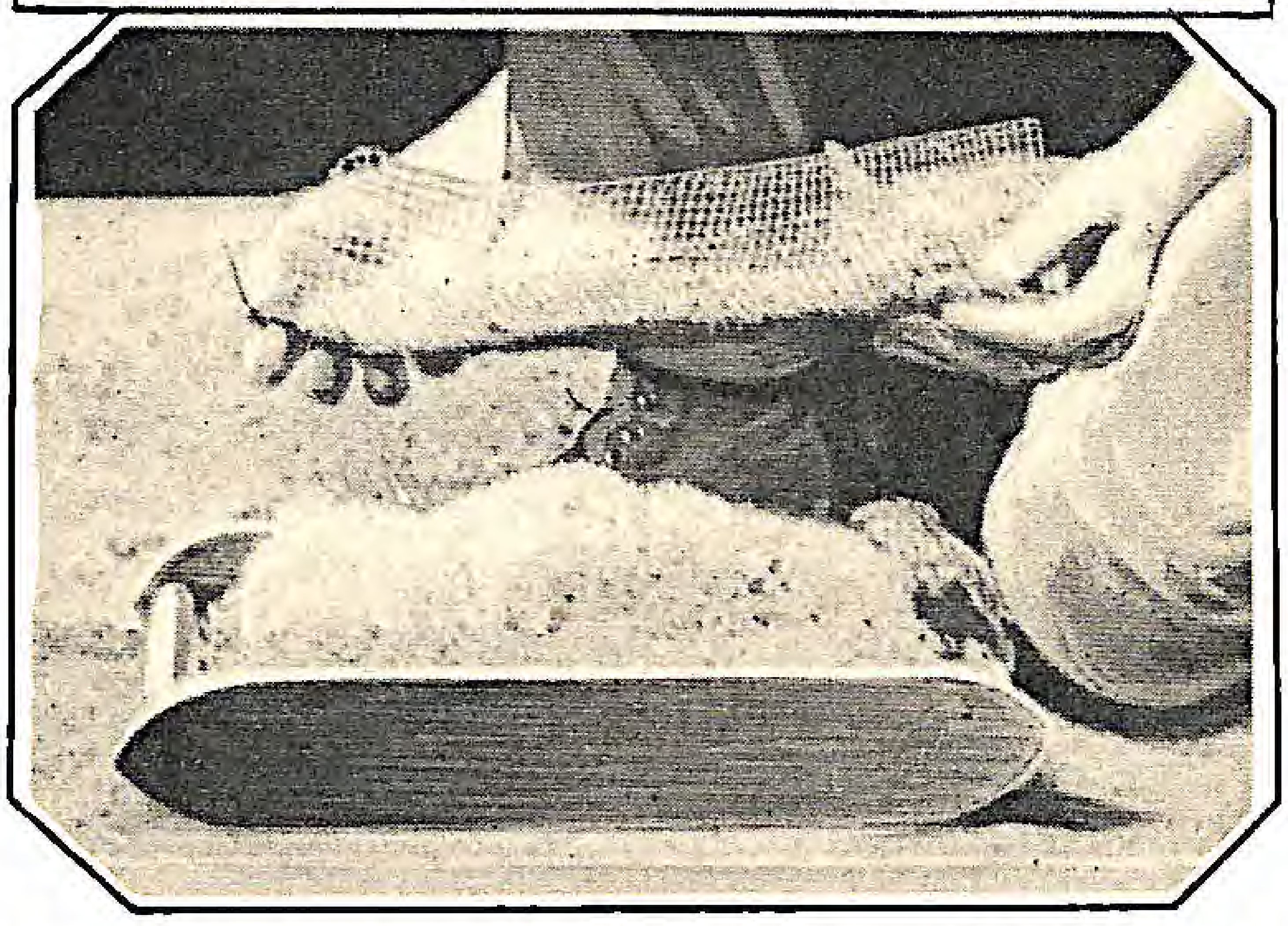
By following these step-by-step instructions you will be carrying out, in somewhat simplified form, the exact procedure used by your foundry-man in making single castings.

The pattern for the casting is usually fashioned from soft wood, using the small tools found in any shop. A saw, a pocket knife, a chisel and some sand paper are sufficient for making many small patterns. A coat of shellac will keep out moisture and check warping.

The form in which the mould is made is called the "flask." It consists of two boxes with neither top nor bottom, each of about

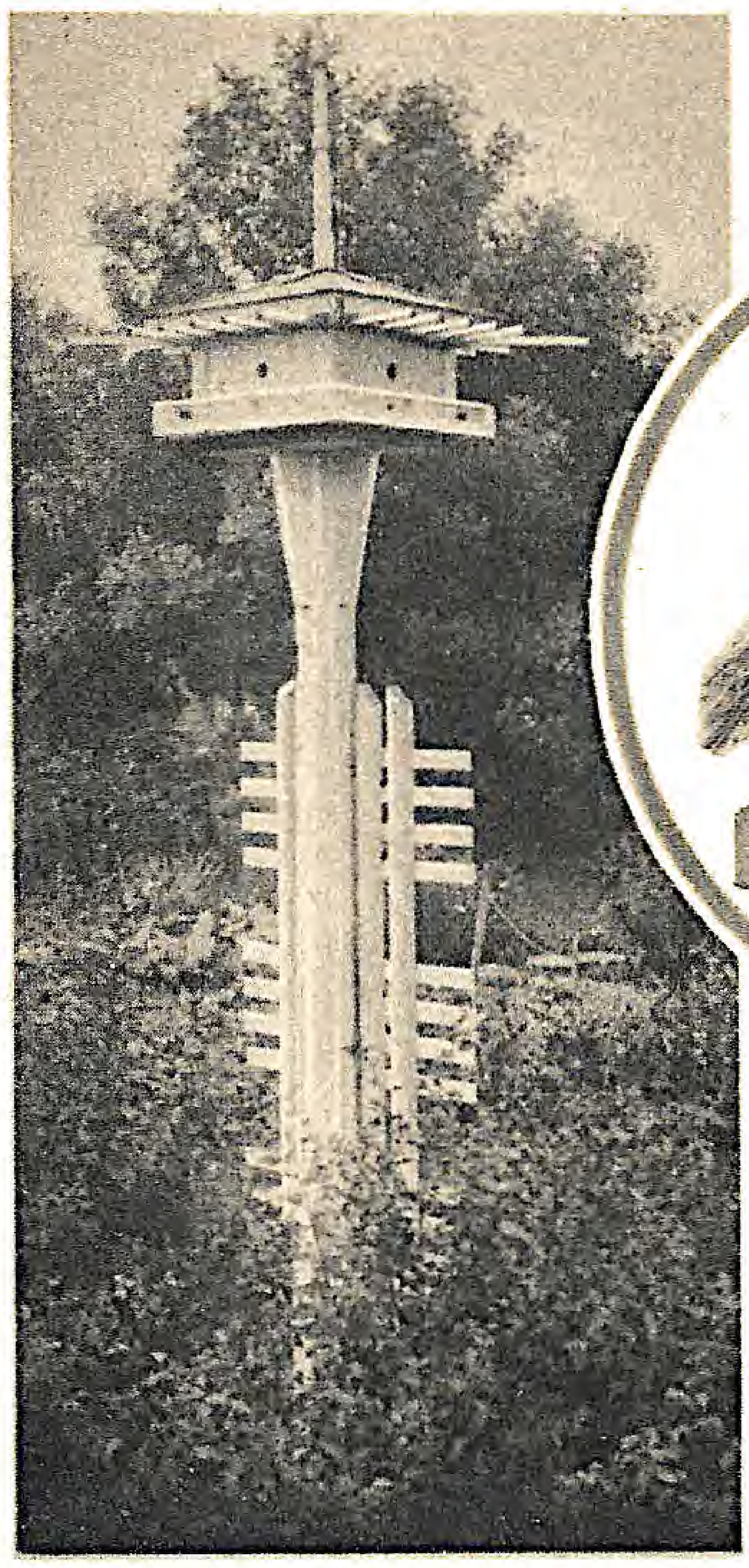
[Continued on page 124]



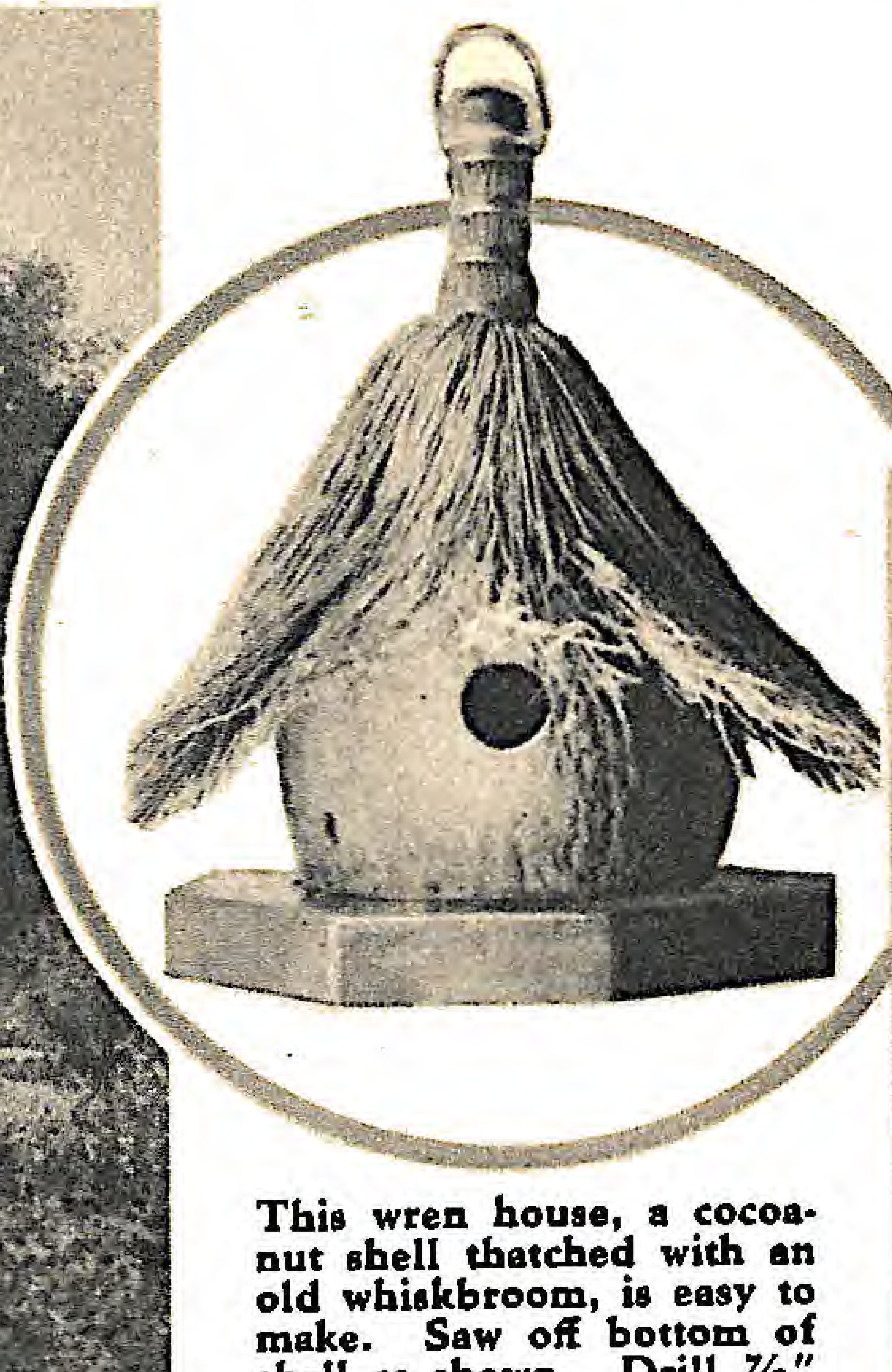


Screen all sand over mold to break up lumps before tamping.

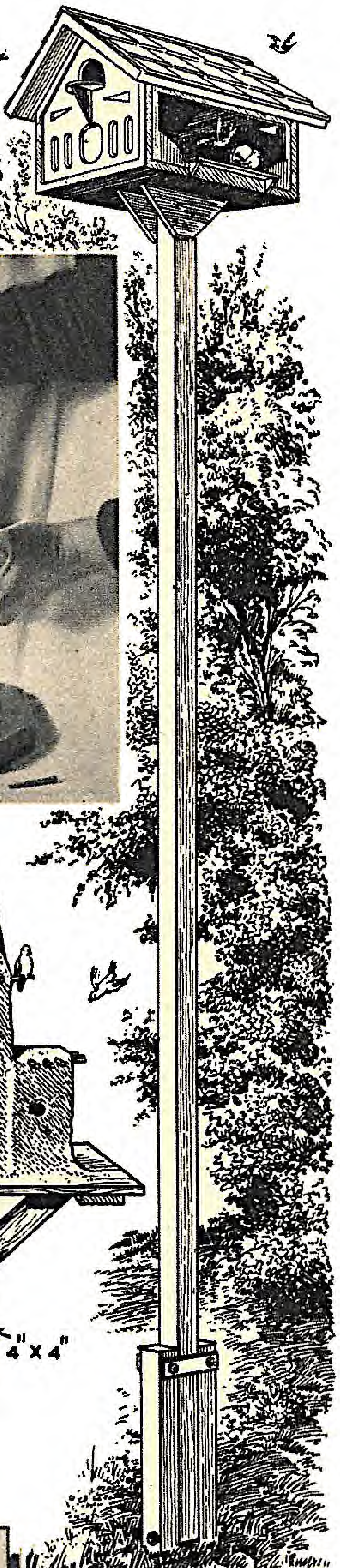
"Castles In The Air" For Friendly BIRDS

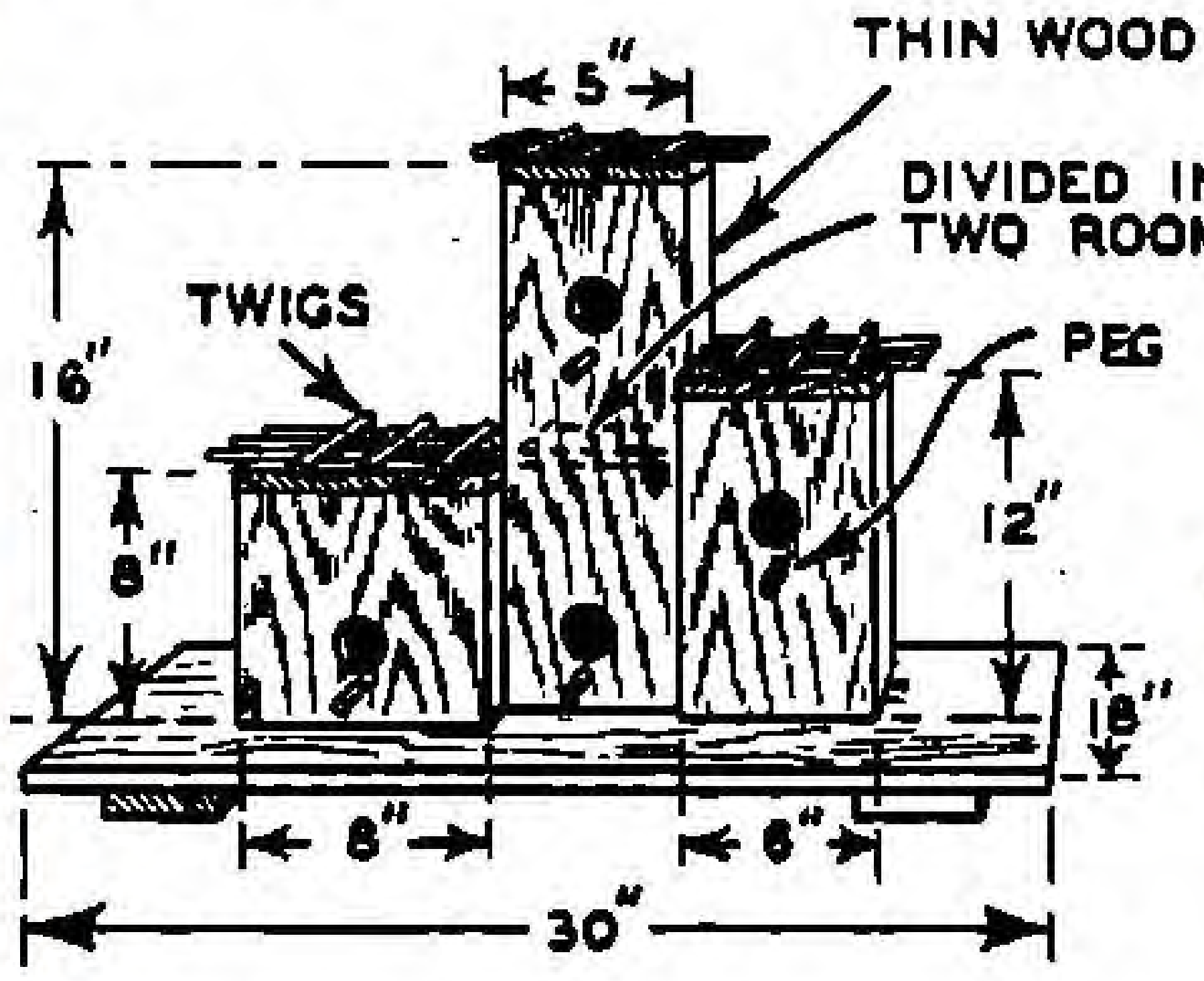


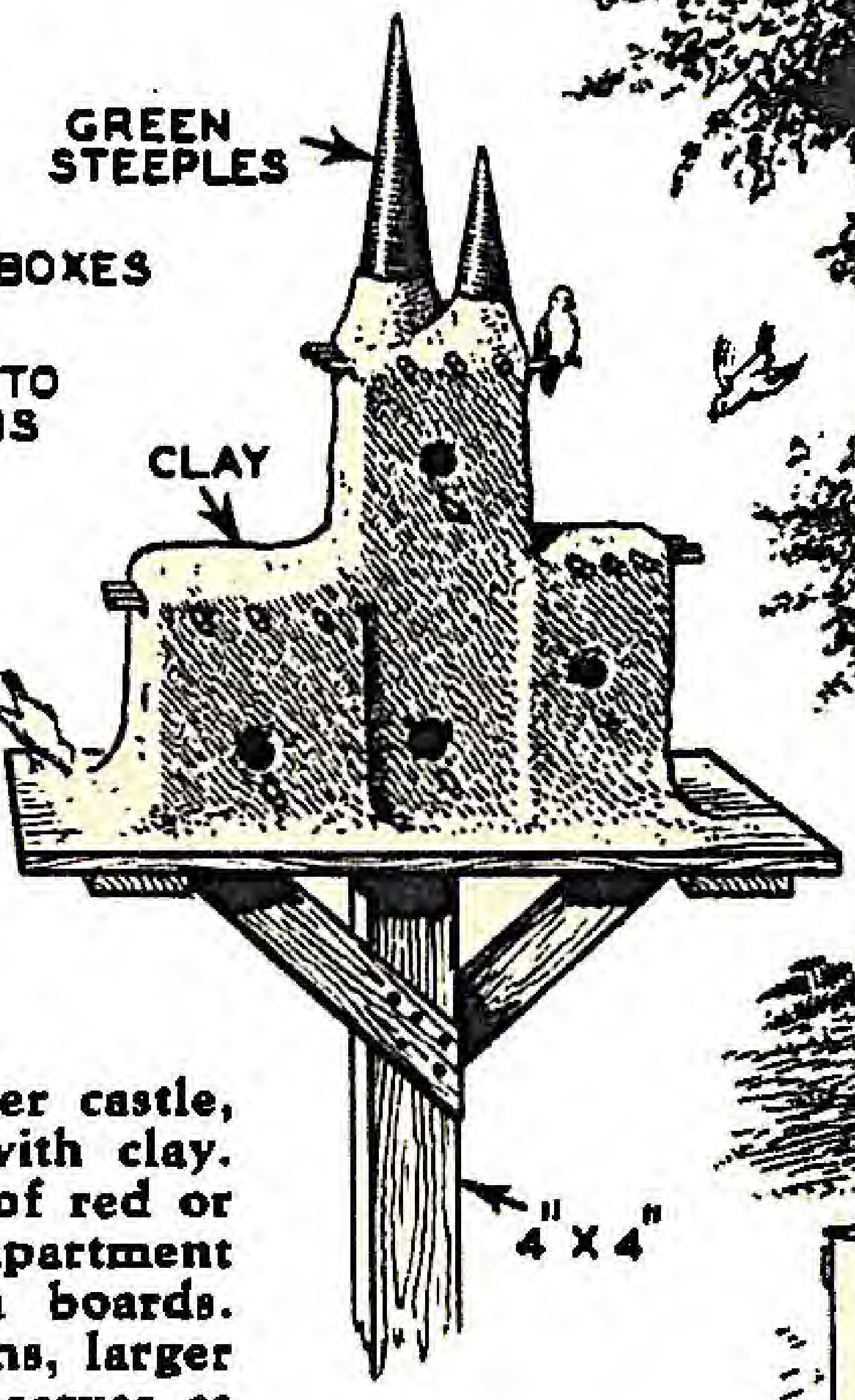
A combination bird house and trellis, painted white with green trim, is a welcome addition to that foliaged corner of the garden. Plant vines beneath.



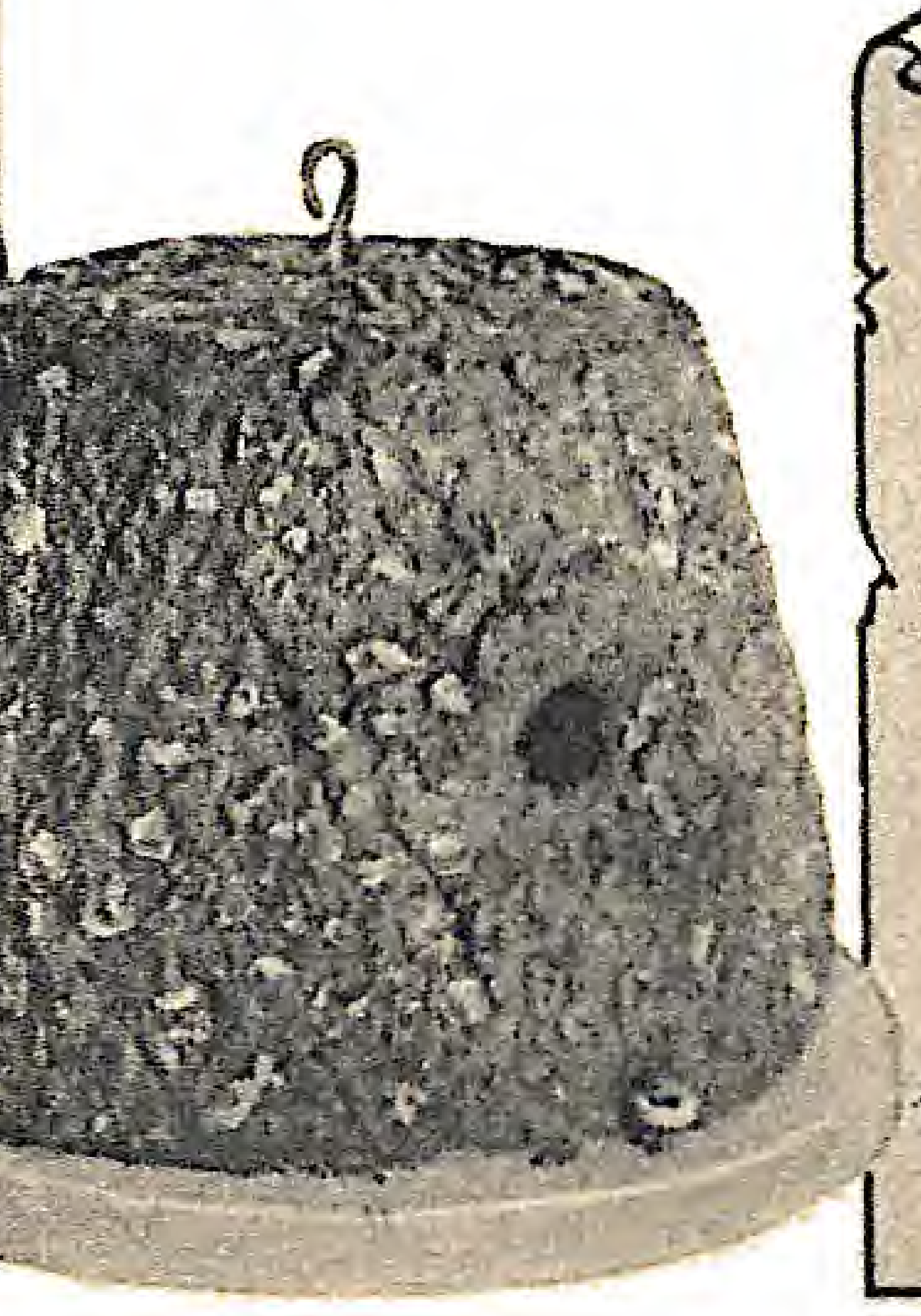
This wren house, a cocoanut shell thatched with an old whiskbroom, is easy to make. Saw off bottom of shell as shown. Drill 7/8" hole for doorway, and drill small hole at top for 1½" screw which goes up into center of broom handle. Shell is screwed to octagonal board base, after drilling holes in wall of house.



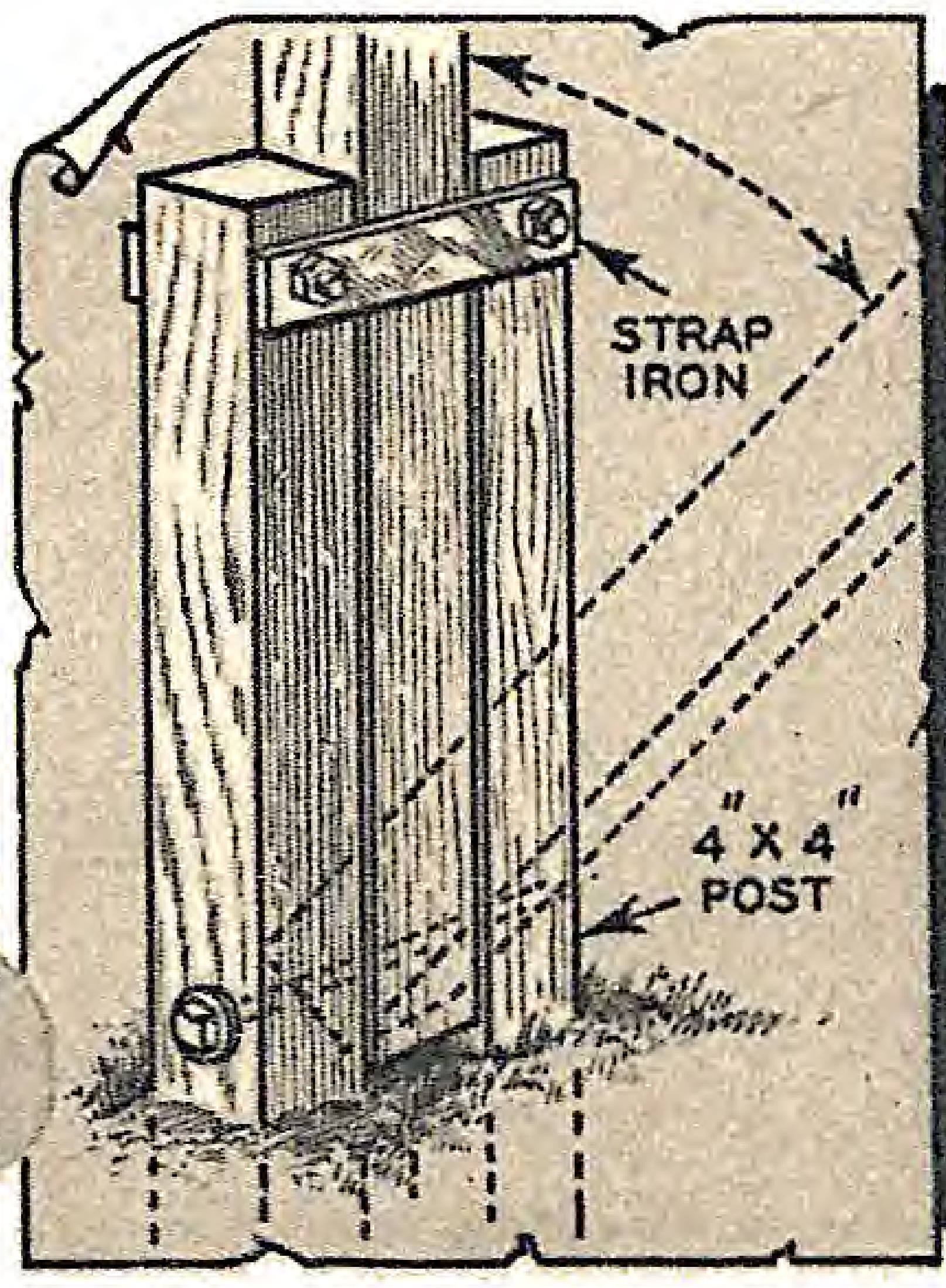




Birds will enjoy this cool summer castle, made from boxes and covered with clay. Paint clay white, and add touch of red or green to two steeples. Each compartment is square, made from any thin boards. Bore 7/8" to 1" openings for wrens, larger holes for other birds. Platform serves as guard against cats. Remove roof to clean.

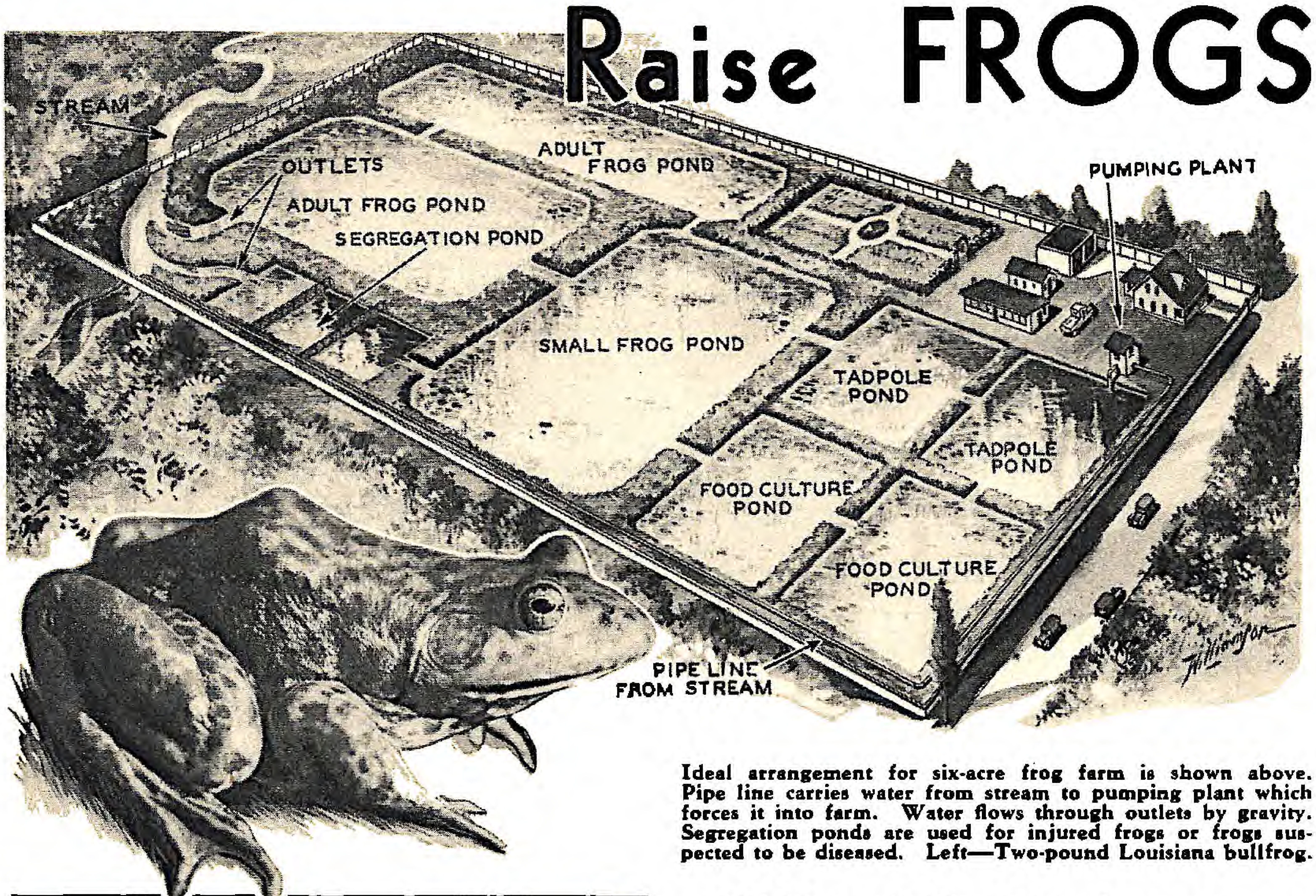


That discarded lamp shade can be put to good use as a bird house. Cover the frame with ¼" mesh screen, fasten a wire hook at the top, cut a 1" diameter hole in side, and mount on wood base. Apply coat of cement, then sprinkle on pieces of colored glass.

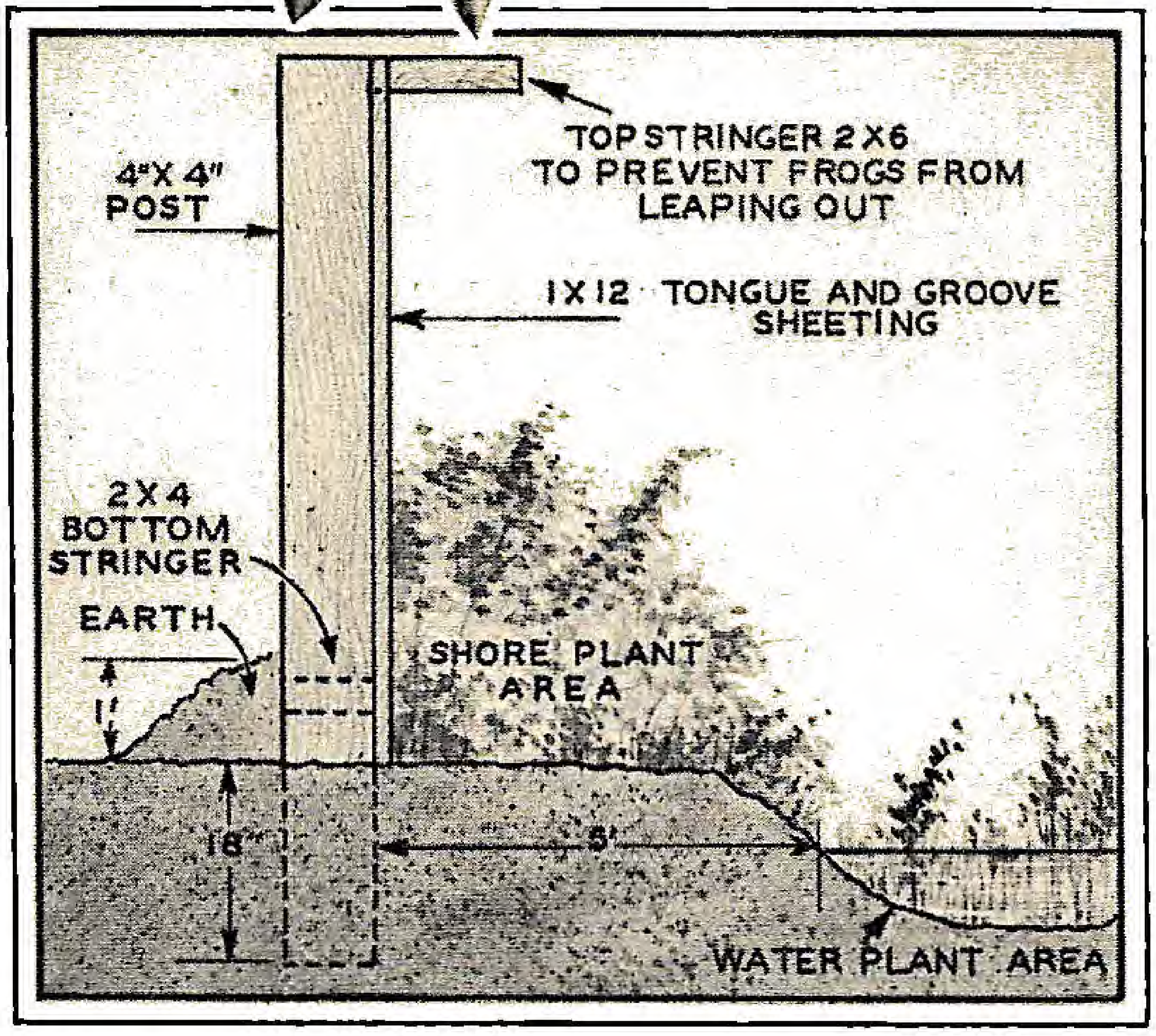


Annual cleaning of bird houses on tall poles is easier if this pivoted mounting is used. House can then be taken down for winter storage, easily set up again in spring. Support post pivots between two 4"x4" uprights sunk into ground, a ¾" bolt going through all three pieces. To tilt support post, simply remove one of iron straps bolted to the tops of uprights.

Raise FROGS


STREAM
OUTLETS
ADULT FROG POND
ADULT FROG POND
SEGREGATION POND
SMALL FROG POND
PUMPING PLANT
TADPOLE POND
TADPOLE POND
FOOD CULTURE POND
FOOD CULTURE POND
PIPE LINE FROM STREAM

Ideal arrangement for six-acre frog farm is shown above. Pipe line carries water from stream to pumping plant which forces it into farm. Water flows through outlets by gravity. Segregation ponds are used for injured frogs or frogs suspected to be diseased. Left—Two-pound Louisiana bullfrog.


TOP STRINGER 2X6 TO PREVENT FROGS FROM LEAPING OUT
4"X 4" POST
1X12 TONGUE AND GROOVE SHEETING
2X4 BOTTOM STRINGER
EARTH
1'
SHORE PLANT AREA
18"
5'
WATER PLANT AREA

The best type of fence for frog farms is a solid wood structure built as shown above to prevent frogs from leaping out.

DURING the past 40 years numerous attempts have been made in nearly every state in the Union to produce bullfrogs as we raise other domestic livestock. The nation is dotted with so-called "frog farms," but upon investigation most of them are found to be experimental establishments with a very limited production.

There are, however, a number of frog farms in various states that have attained sufficient success to prove conclusively that the domestication of the bullfrog is feasible and highly profitable. There is an enormous market demand for frogs as a human food delicacy, for frog skins for the making of high grade leather, and for the manufacture of a powerful glue made from frog skins recently developed by French chemists. This vast market is being only partially supplied at present almost entirely from wild sources of supply. Intensive hunting is rapidly diminishing the wild frogs and it is only a question of time before this source of competition will be eliminated for the frog farmer. The bullfrog has already taken his place among the ranks of valuable domestic animals. Rich rewards will await those who can produce marketable frogs in commercial quantities.

There are numerous species of edible frogs in various parts of the United States but one is especially susceptible to domestication and large enough to be of market value. This is the Louisiana bullfrog, *Rana catesbiana*, a native of several southern states, which has been successfully acclimatized in many foreign countries and practically every state in the Union.

The bullfrog is an amphibious, shoreline creature. He is largely nocturnal in his habits. He is carnivorous and feeds entirely upon living food. Crayfish, top minnows, and insects, are his favorite titbits, but he will snap at any living organism he can swallow —including the tadpoles and young of his

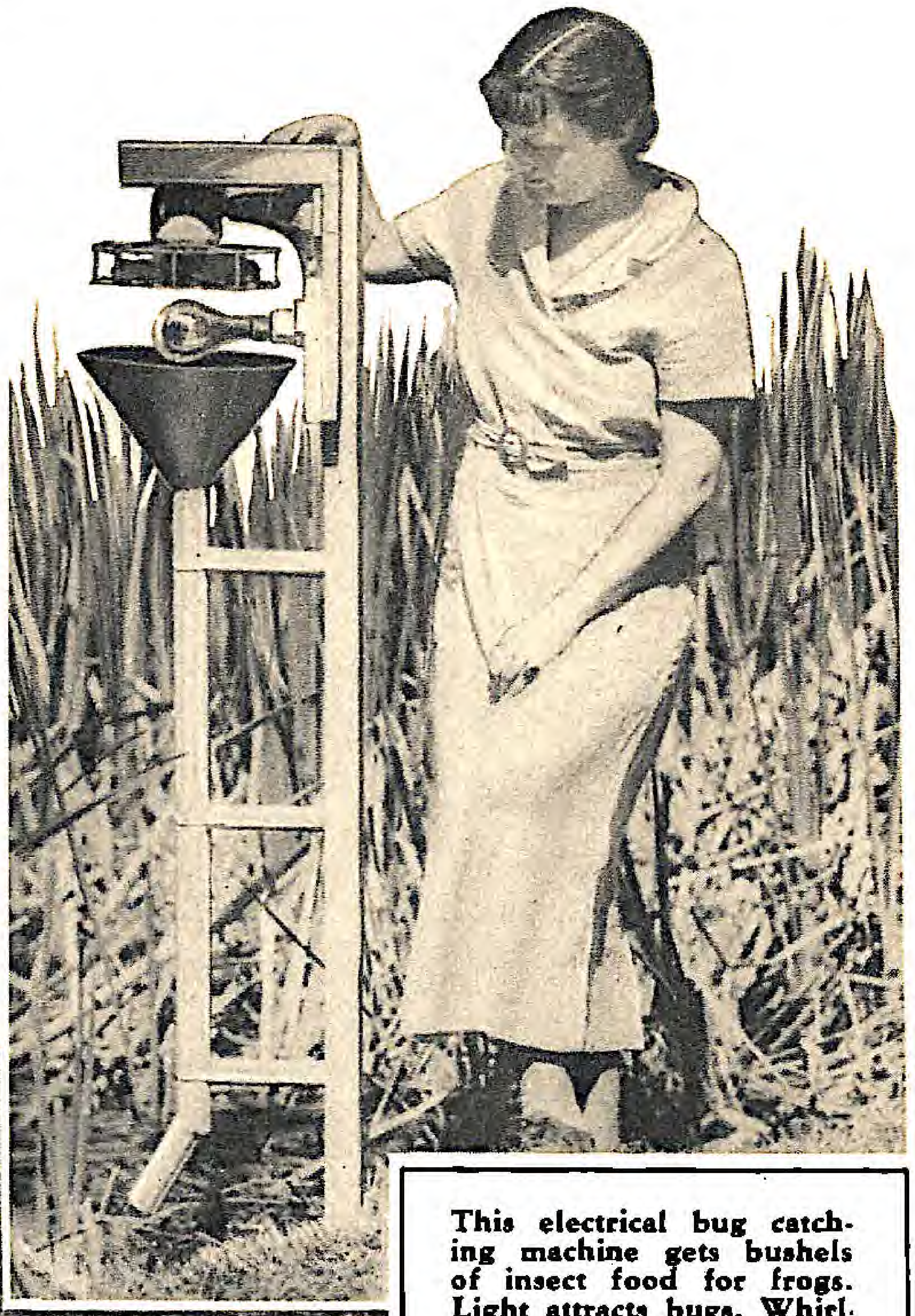
For Big PROFITS

by
JOHN EDWIN HOGG

own kind. Throughout his entire life cycle he is beset by numerous natural enemies. He cannot stay out of water longer than his skin will remain wet. He cannot tolerate intense sunshine or dry heat without the immediate presence of shade and water. He is "cold blooded"—meaning that his blood temperature is always that of the air or water in which he lives. His physical energy increases with rising temperature and decreases with lowering temperature. Frogs are in danger if water temperatures rise above 100 degrees (F.) and both tadpoles and frogs go into a state of suspended animation (hibernation) when air and water temperatures go below 50 degrees. These biological facts must govern the principles of frog farming.

Bullfrogs can be raised in back yards, but a farm of six acres is a good size for a serious commercial venture. The maximum capacity of a well-managed, six-acre ranarium, as a frog farm is known, is probably not more than 10,000 adult frogs per year, even under the the intensive methods of culture practiced in Japan where frog farming has attained greater success than in any other country. Nevertheless, with marketable frogs bringing 25c to 50c each at present American wholesale prices, no other stock raising endeavor promises greater financial returns per acre.

Certain natural conditions must be present to render any piece of land a feasible site for a frog farm. The land must be fairly level. A cheap, abundant, and dependable water supply is imperative. Locations in river bottoms are liable to involve disastrous flood



This electrical bug catching machine gets bushels of insect food for frogs. Light attracts bugs. Whirling fan forces them into funnel-tube to the water.

This small frog farm in southern California has a woven wire fence with a horizontal top flange to keep frogs from leaping out. Note the luxuriant growth of vegetation which supplies food and shade and attracts insects which the frogs devour.

Wires Over Farm Prevent Hawks from Attacking and Killing Frogs

hazards. Poor or worn-out soils that will not support a luxuriant growth of shoreline and aquatic vegetation are useless. Soil having a fair lime content is essential for the culture of crayfish for frog food. Water derived from natural stream flow is preferable to sterile well water. If these conditions have to be created artificially the labor and expense involved will doom the prospective frog farmer to failure before he starts.

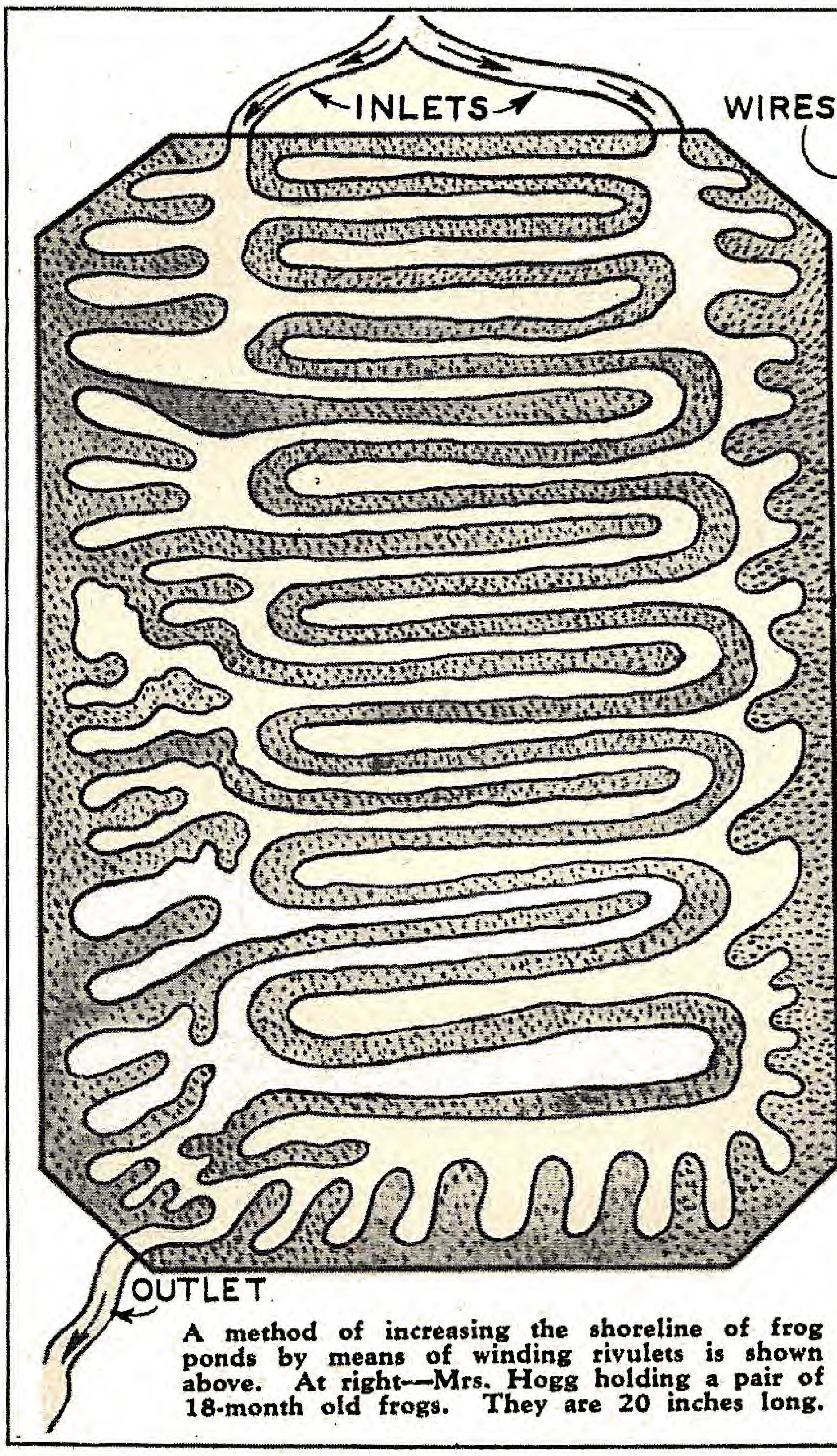
Having acquired suitable land by lease or purchase the development of the ranarium should proceed in the following order of operations: 1. The creation of water areas; 2. The development of shoreline and aquatic vegetation; 3. The culture of frog food; 4. The construction of fences; and 5. The culture of frogs.

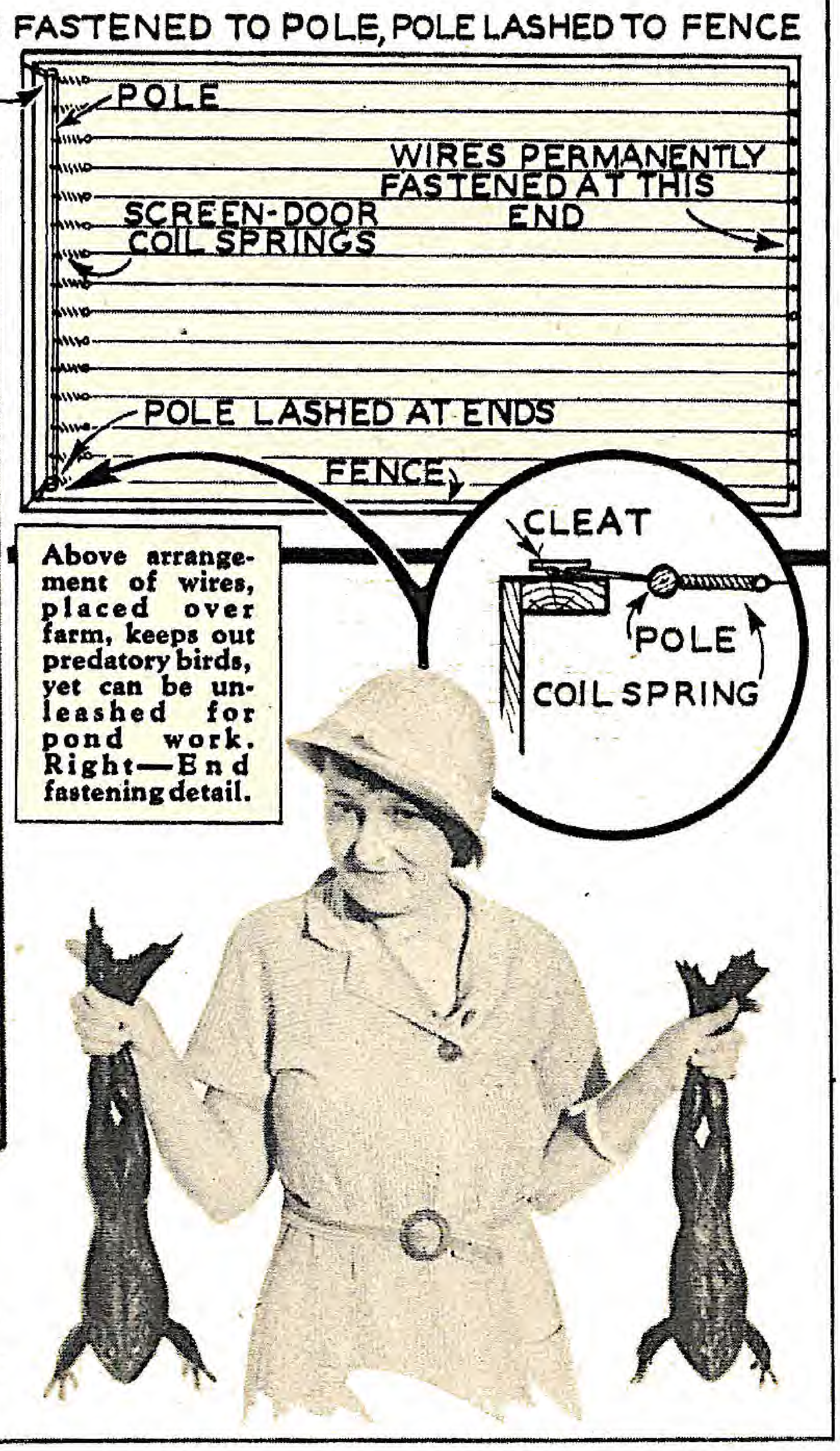
The frog farmer must aim to accomplish the following purposes: 1. The protection and retention of breeding stock; 2. The protection of frog spawn; 3. Forcing the growth and metamorphosis of tadpoles; 4. The prevention of migration; 5. The protection of young frogs from their various natural enemies, including the cannibalistic habits of their elders; and 6. The protection of adult frogs and the feeding of both young and adults.

It is the length of the shoreline that determines how many frogs a pond of a given water area will support. In the southern states a water depth of from 12 to 18 inches is sufficient. Farther north ponds must be deep enough to permit tadpoles as well as frogs to hibernate below the maximum depths of freezing. A method of increasing frog pond shorelines is shown in the illustrations.

Ponds excavated in clay or "adobe" soils will usually retain water but will require fertilization before they will support the necessary plant life. Ponds dug in sandy or

[*Continued on page* 122]

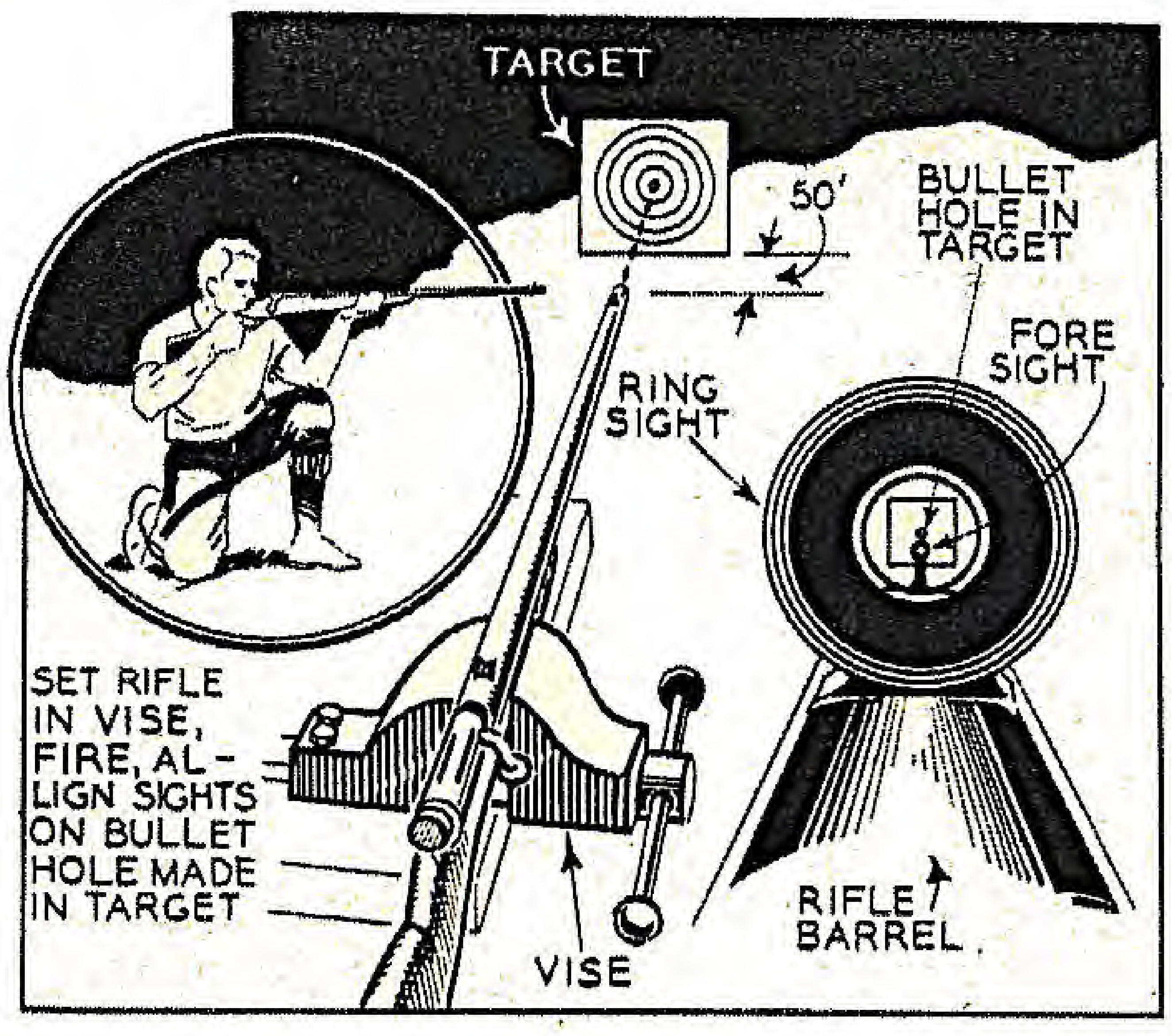



WIRES FASTENED TO POLE, POLE LASHED TO FENCE
POLE
WIRES PERMANENTLY FASTENED AT THIS END
SCREEN-DOOR COIL SPRINGS
POLE LASHED AT ENDS
FENCE
CLEAT
POLE
COIL SPRING

Above arrangement of wires, placed over farm, keeps out predatory birds, yet can be unleashed for pond work. Right—End fastening detail.

A method of increasing the shoreline of frog ponds by means of winding rivulets is shown above. At right—Mrs. Hogg holding a pair of 18-month old frogs. They are 20 inches long.

TIPS FOR HUNTERS AND CAMPERS

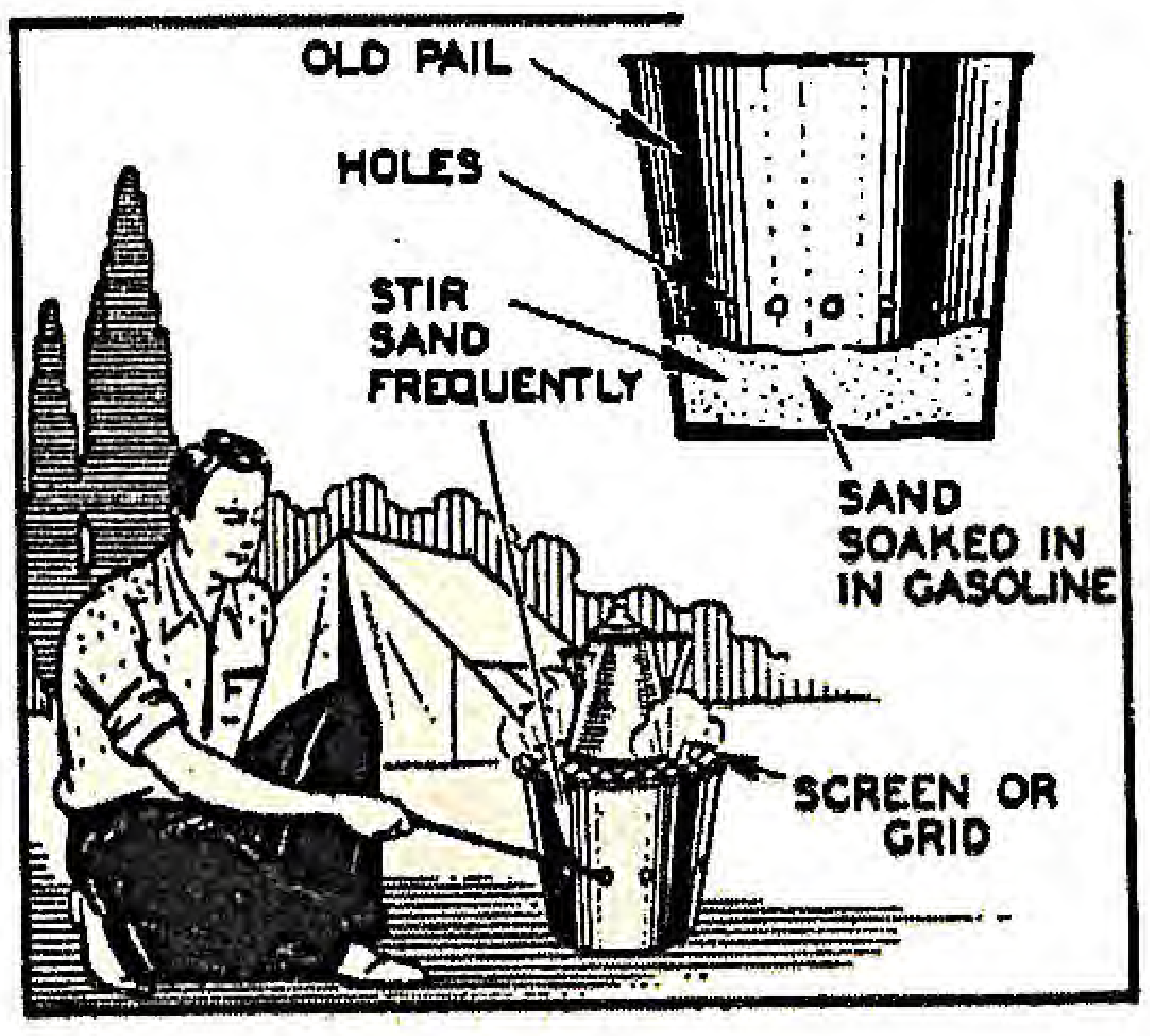

TARGET
50'
BULLET HOLE IN TARGET
FORE SIGHT
RING SIGHT
SET RIFLE IN VISE, FIRE, ALIGN SIGHTS ON BULLET HOLE MADE IN TARGET
VISE
RIFLE BARREL

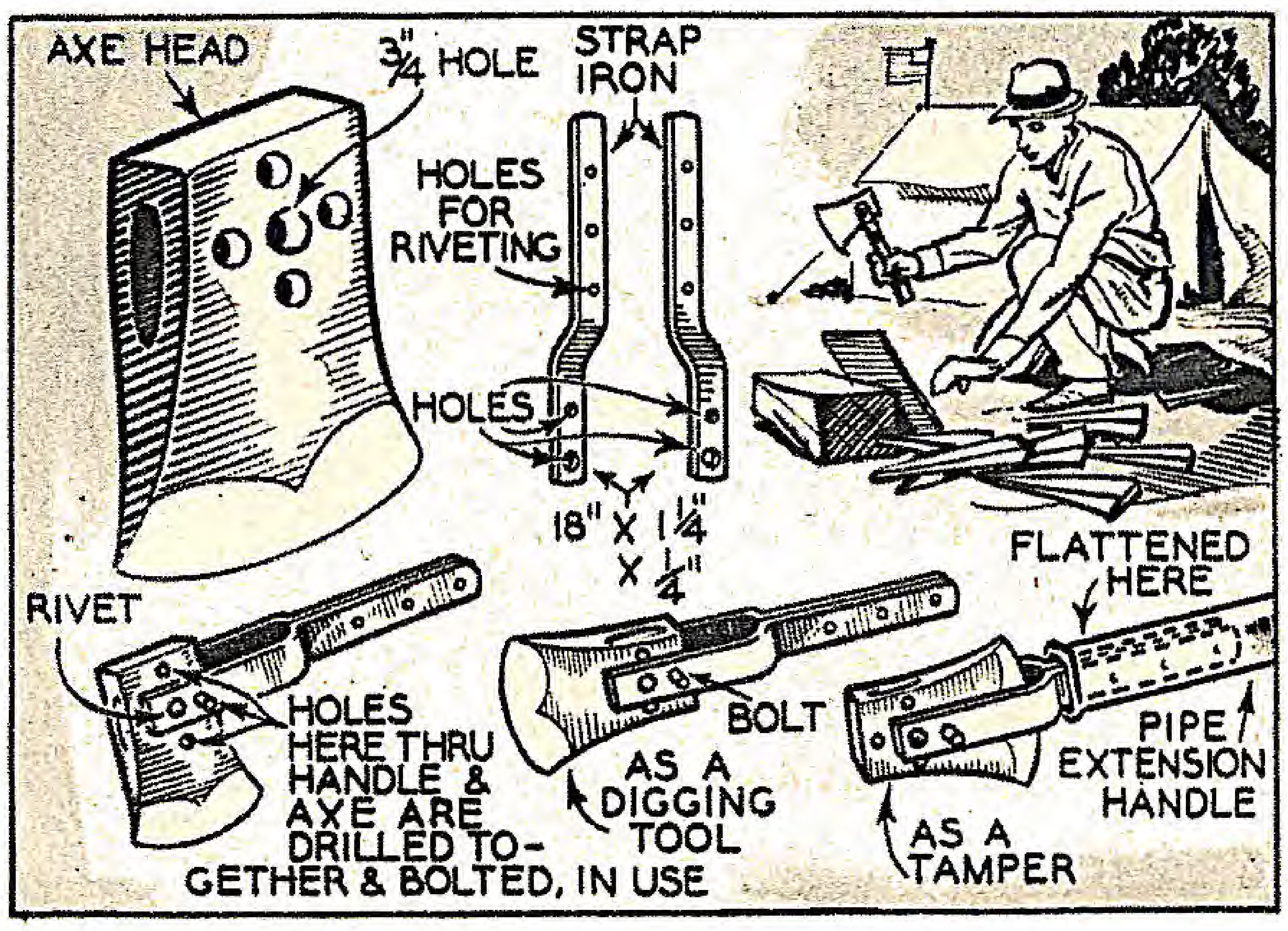
Clamp Rifle In Vise To Adjust Sights

ADJUSTABLE rifle sights often come improperly set for individual methods of sighting, and are sometimes jarred out of line through careless handling. To remedy this mistake, clamp the rifle firmly into a vise and fire a random shot into a piece of white paper set about fifty feet from the end of the gun. Then, without moving the gun, set the sights in perfect alignment with the bullet-hole in the card. Secure the sights at this setting, and they will be perfectly adjusted for accurate shooting. This method may also be used by a purchaser to suit a new gun to his individual shooting peculiarities.—Emerson Tichenor.

Gas, Sand Mixture Makes Safe Fire For Camp

ON BEACHES, picnic grounds, and public parks where campfires are not permitted due to the unsightly litter of charred wood and ashes they cause, an unobjectionable, yet efficient fire can be made by burning a mixture of gasoline and sand in an old galvanized bucket. Fill the bucket one-quarter full of sand and add gasoline until the mixture is of a "mud-pie" consistency, leaving no excess gasoline to float on the top. Perforations above the sand level admit air. If stirred frequently, the mixture will burn about as fast as a small gasoline stove.—Hi Sibley.


OLD PAIL
HOLES
STIR SAND FREQUENTLY
SAND SOAKED IN IN GASOLINE
SCREEN OR GRID

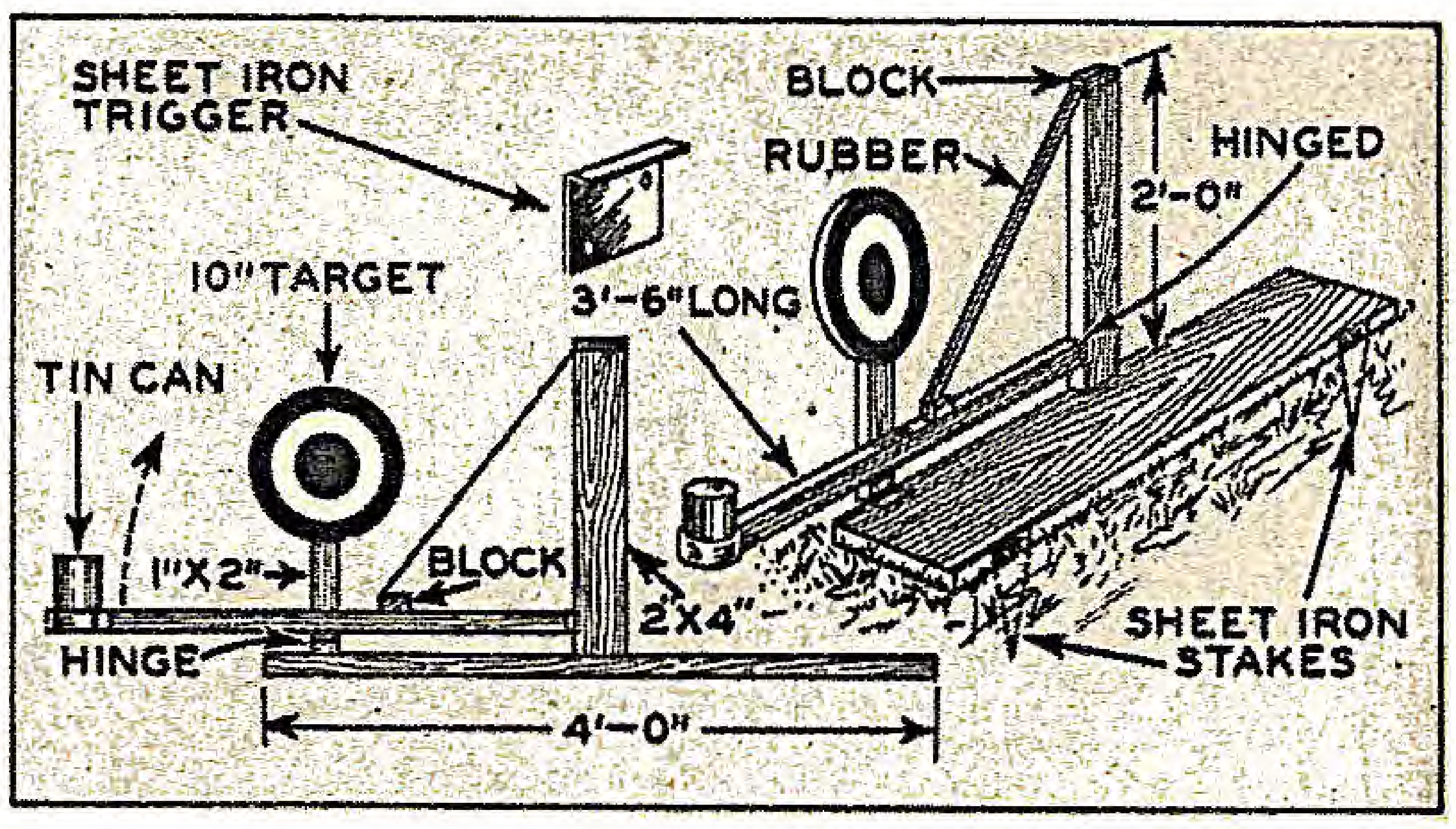

AXE HEAD
¾" HOLE
STRAP IRON
HOLES FOR RIVETING
HOLES
18" X 1¼ X ¼"
FLATTENED HERE
RIVET
HOLES HERE THRU HANDLE & AXE ARE DRILLED TOGETHER & BOLTED, IN USE
BOLT
AS A DIGGING TOOL
PIPE EXTENSION HANDLE
AS A TAMPER

Camp Axe Does Triple Duty

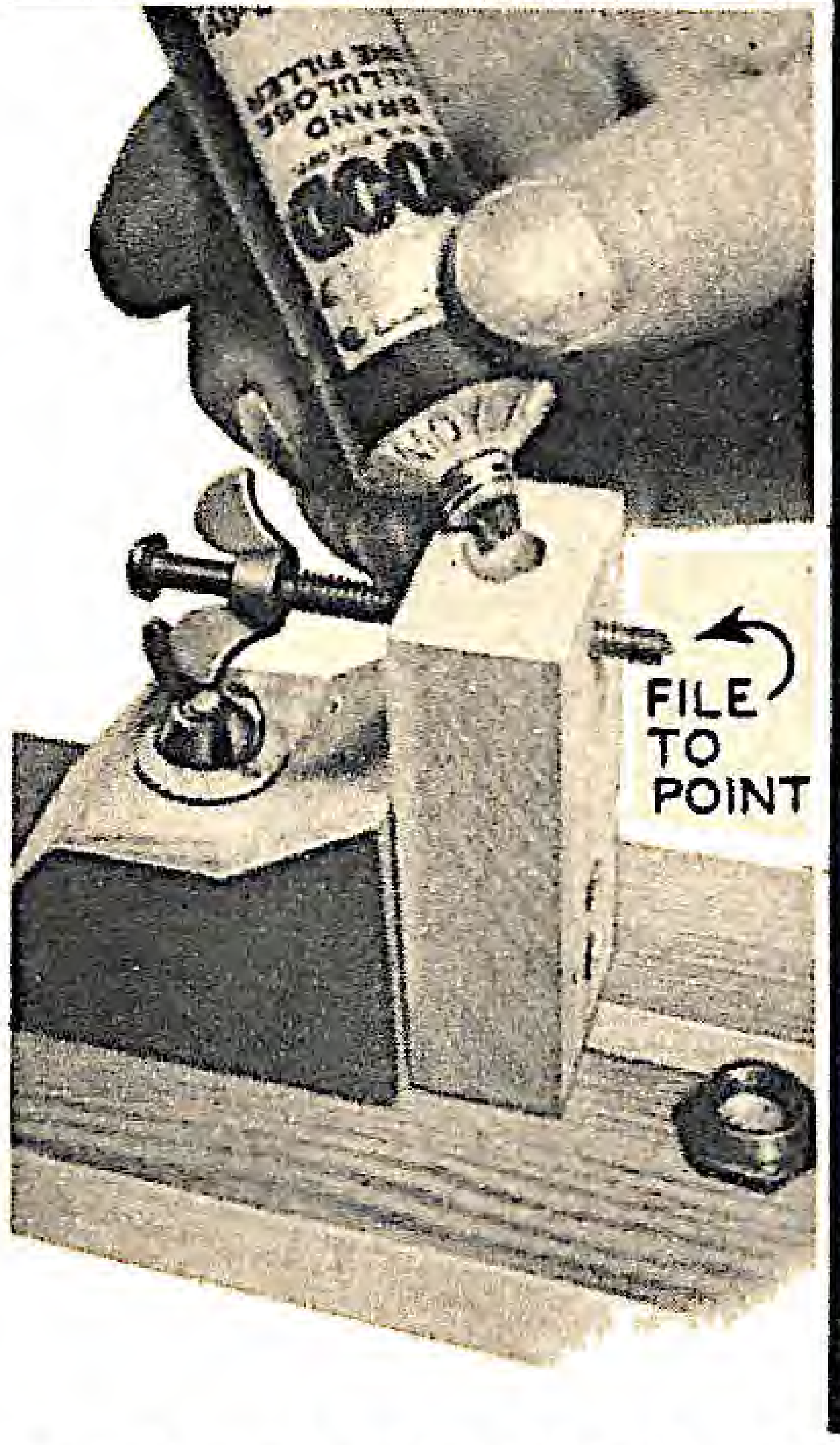
A HANDY axe for campers and tourists can easily be constructed to serve triple duty as an axe, a shovel, and a tamper. Bore a three-quarter inch hole through the center of the axe-handle eye, and drill two one-half inch holes vertically and horizontally in line with the center of the first hole. Rivet together two strips of strap iron, offset from each end, and drill a hole in each through which to rivet the axe head. Then drill holes for bolts to hold head secure.—A. H. Waycoff.

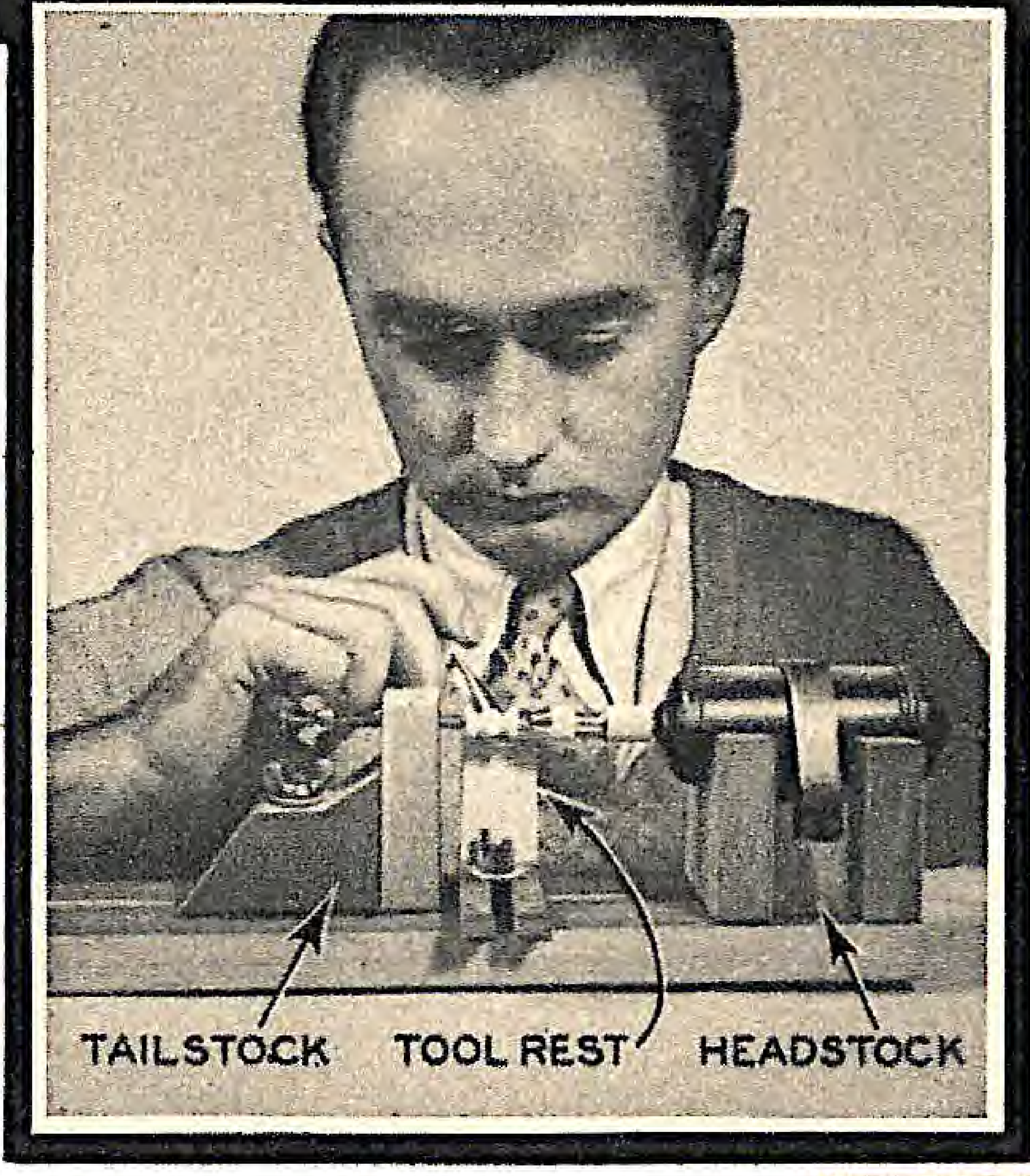
Double Target Throws Tin Cans

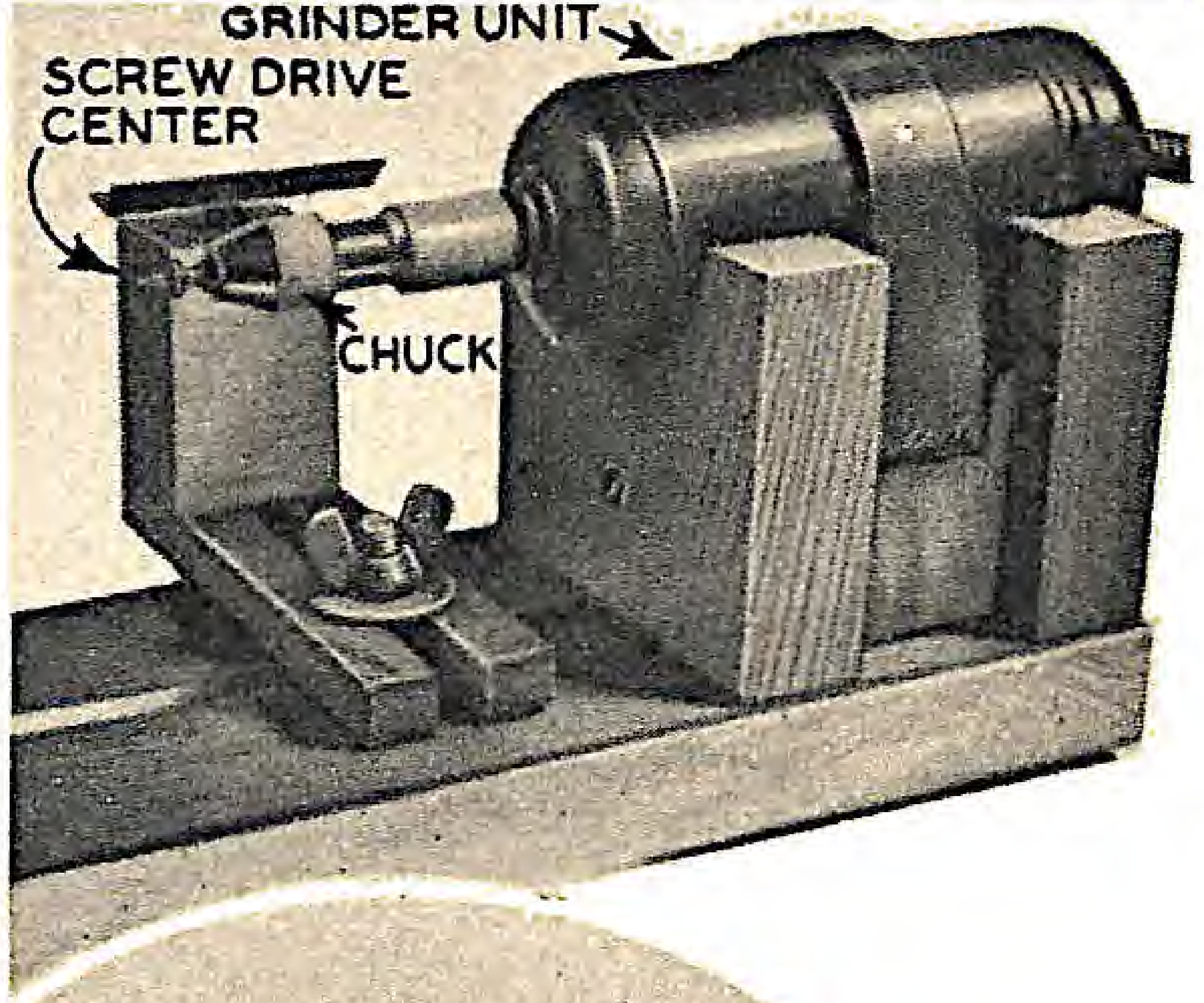
SHOOTING practice, both on stationary and moving targets, is possible through the use of an ingenious arrangement that uses the stationary target as a trigger to release the sling arm when a direct hit is scored. The arm is hinged to an upright and resists the pull of a taut rubber by the pressure of the sheet-metal trigger. Released, the rubber snaps to shoot target.—G. E. Van Horn.

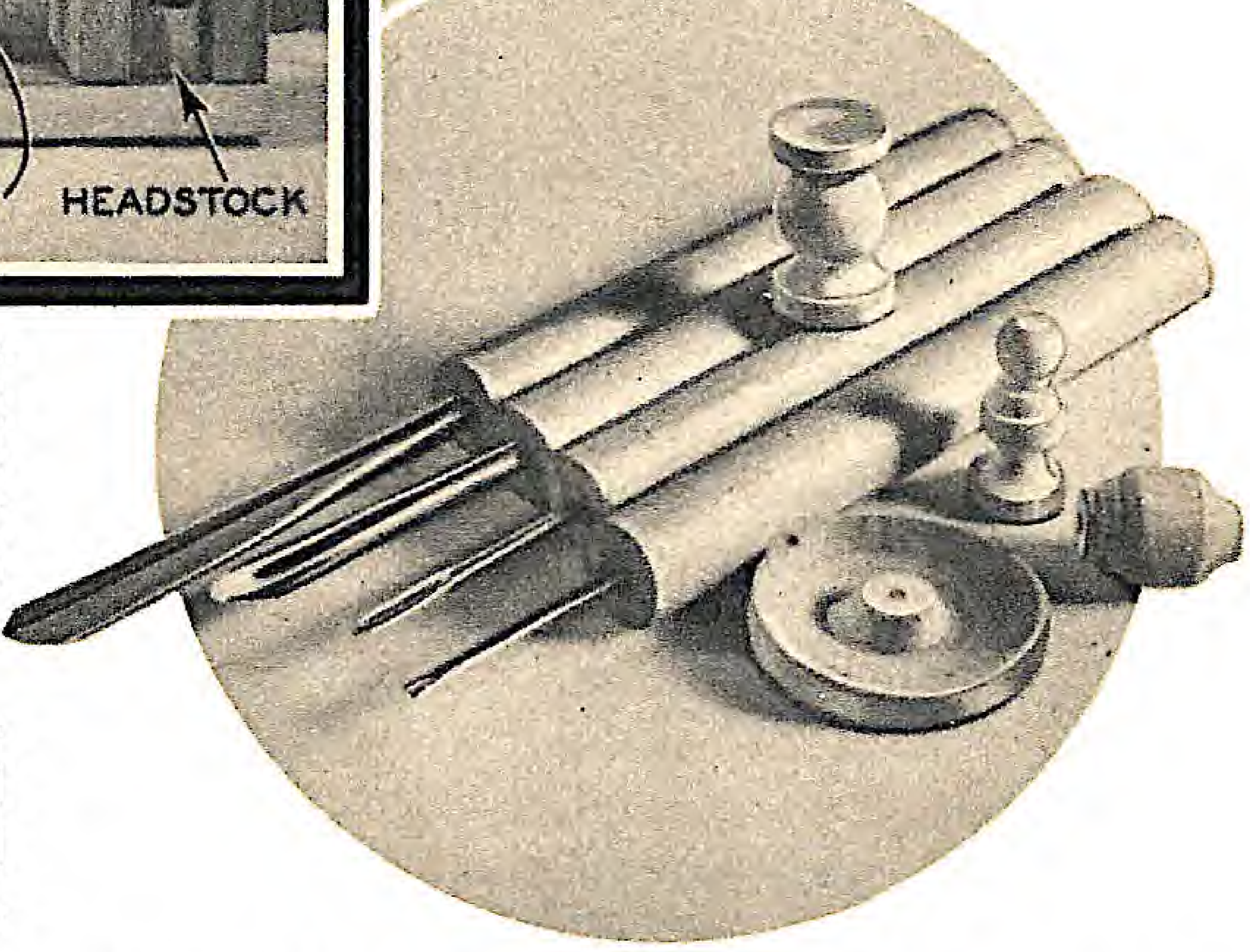

SHEET IRON TRIGGER
BLOCK
RUBBER
HINGED
2'-0"
10" TARGET
3'-6" LONG
TIN CAN
1"X2"
BLOCK
2X4"
HINGE
SHEET IRON STAKES
4'-0"

POWER GRINDER DRIVES MIDGET LATHE









Power grinder serves both as headstock and as driving unit for this handy little model maker's lathe. Examples of work which can be done, together with needle-in-dowel tools used for this small work, are shown at right. Lathe bed is made of two pieces ⅞"x1⅜"x16" hardwood; tailstock is 3"x1¼"x¾". Drill hole for pointed bolt serving as center; drill large intersecting hole down from top, fill with wood filler to form threads for bolt. Tool rest and tailstock slide along lathe bed.

A SPEEDY model maker's lathe for turning very small pieces can be constructed from scraps of hardwood, with one of the hand size power grinders used as combination headstock and power unit. The grinder already has a chuck; for most work one of the screw-point mandrels ordinarily supplied with the grinder will be satisfactory for both face plate and screw center turning.

The cutting tools are made by mounting various sizes of steel needles in dowel handles, grinding the needles carefully down to the size and shape required for the work at hand.

Keep your cutting tools sharp, take light cuts at high speeds, and you will be able to turn out accurate, smooth pieces for your model train, boat or plane.

Make Watch Crystal Shatterproof

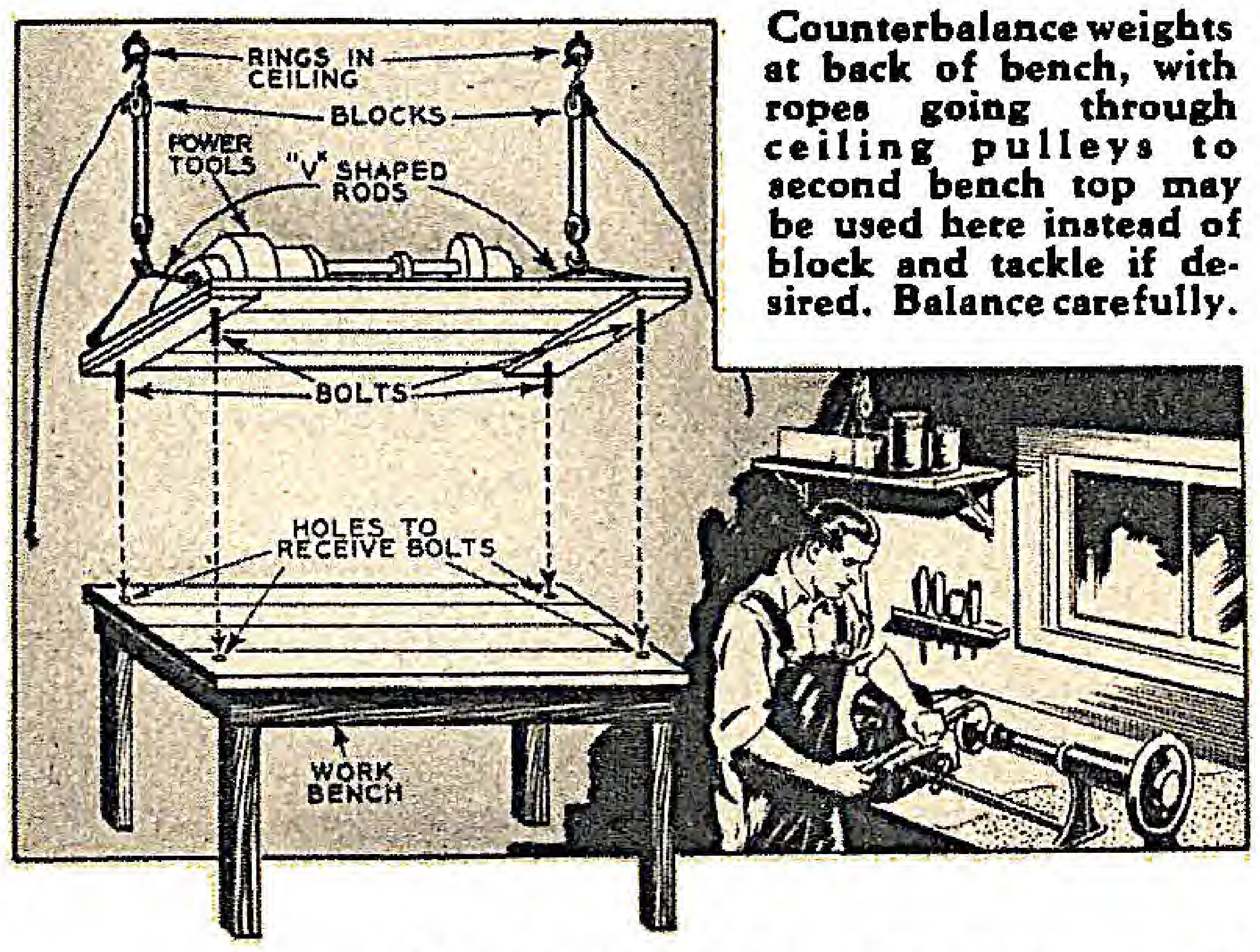
FINGER NAIL POLISH

Coating inside of watch crystal with liquid fingernail polish, clear or coral tinted, makes glass shatterproof. With clock crystals flow polish over inside, then drain off.

A COAT of clear lacquer or fingernail polish applied to the inside of your watch crystal will hold the fragments of glass together when broken, permitting use of the watch.

Double Top Bench Saves Space

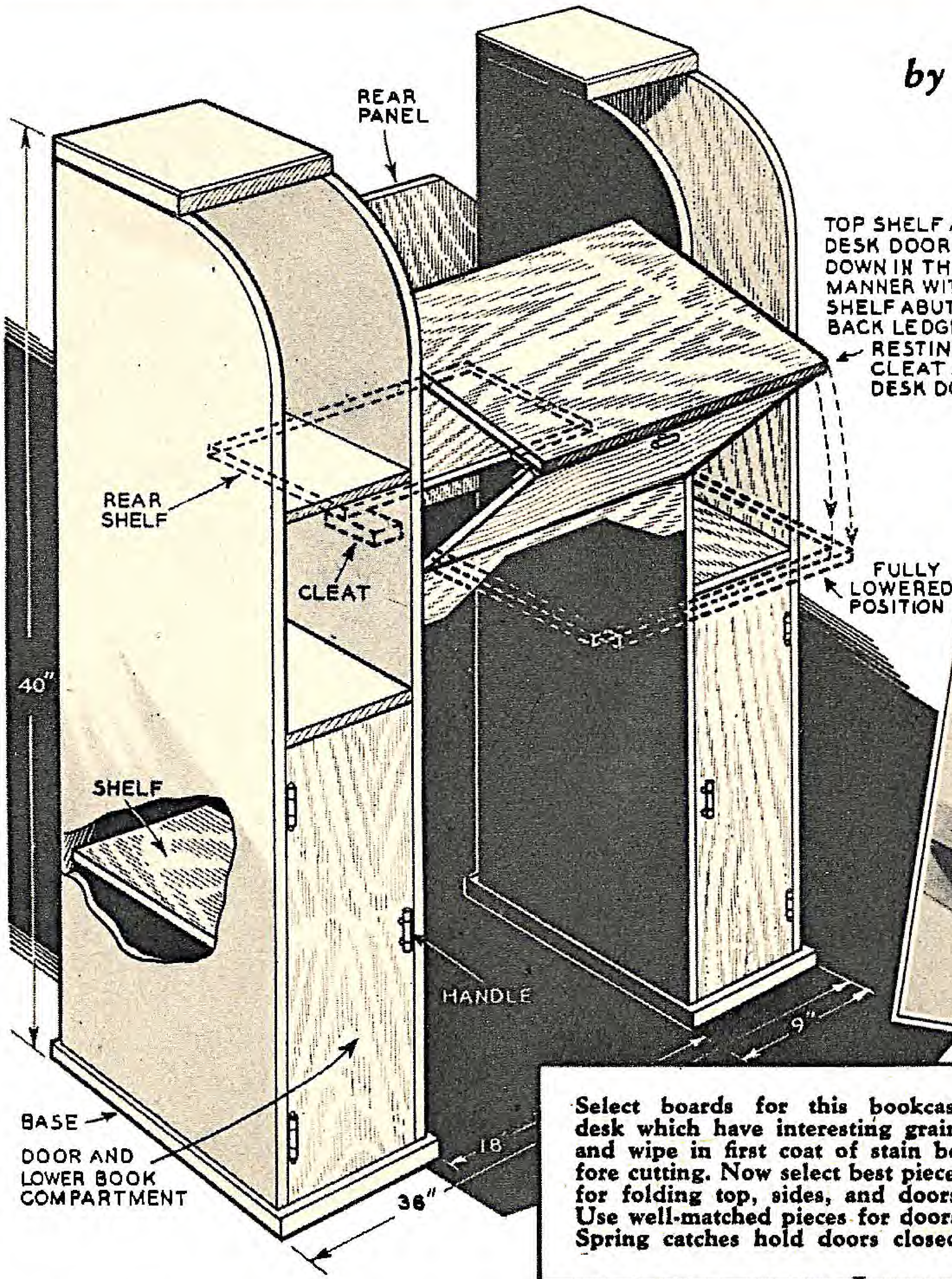
IN SMALL shops where space is not available for a separate bench for the power tools, this double top work-bench will be found very convenient. Mount the power tools and motor on the second top, suspending this from the ceiling with block and tackle so it can be raised out of the way when not in use. Bolts through each corner align the two bench tops when power tools are used. Use one-inch hardwood boards.



Counterbalance weights at back of bench, with ropes going through ceiling pulleys to second bench top may be used here instead of block and tackle if desired. Balance carefully.

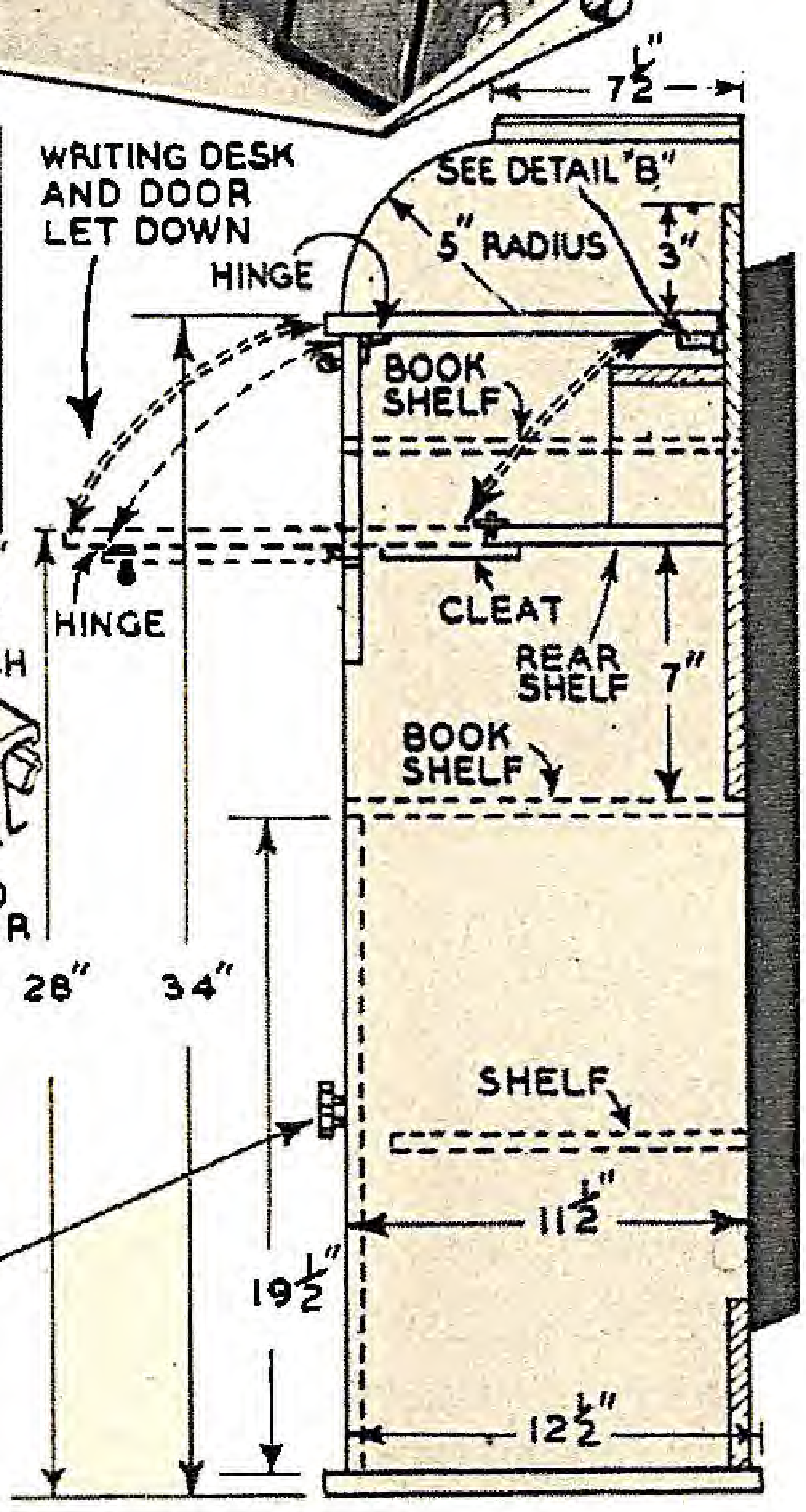
Bookcase Serves Also As Writing Desk

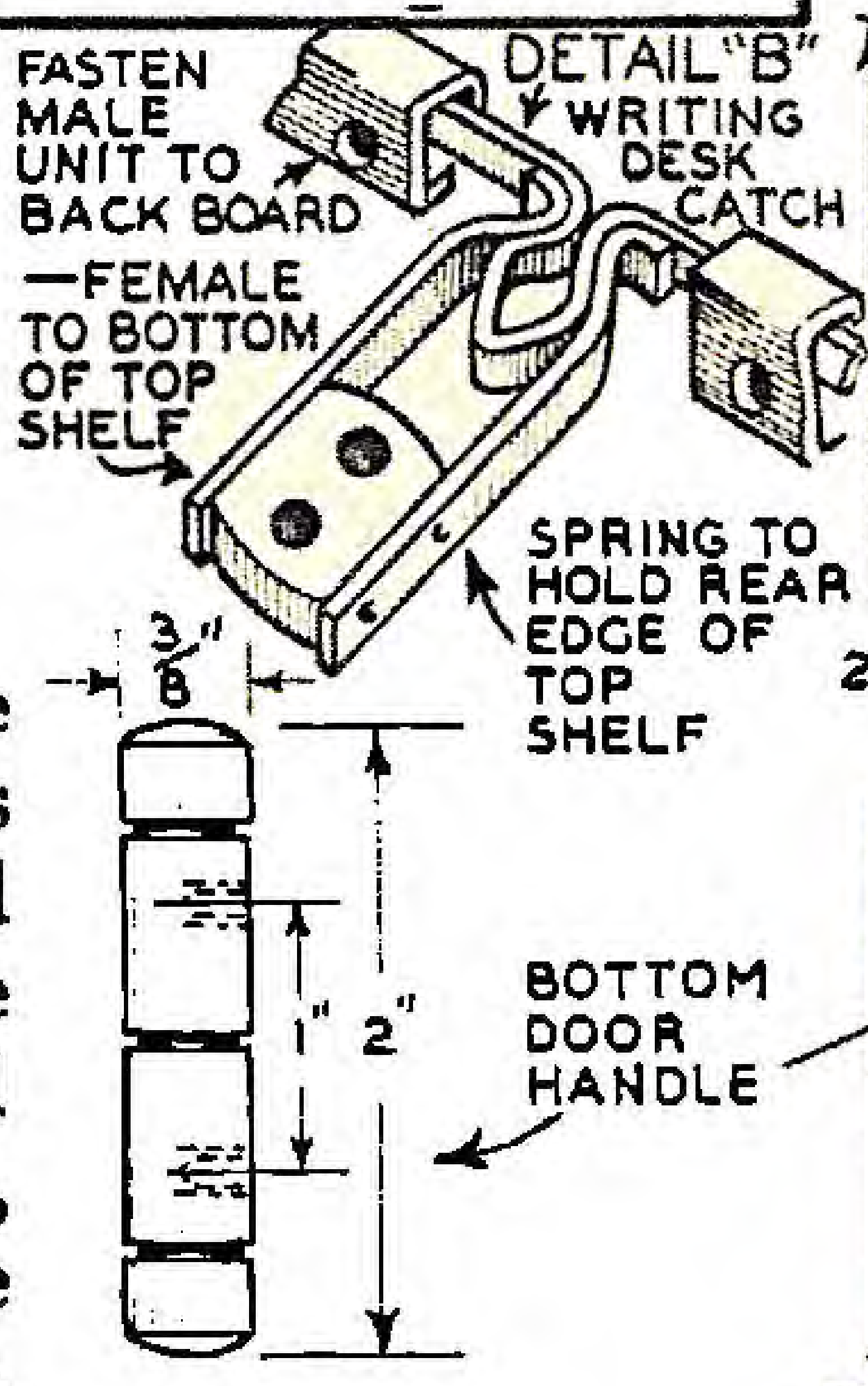
by **RUSH HOWARD**


REAR PANEL
TOP SHELF AND DESK DOOR COME DOWN IN THIS MANNER WITH SHELF ABUTTING BACK LEDGE AND RESTING ON CLEAT AND DESK DOOR
REAR SHELF
CLEAT
FULLY LOWERED POSITION
40"
SHELF
HANDLE
9"
BASE
DOOR AND LOWER BOOK COMPARTMENT
18
36"

Select boards for this bookcase desk which have interesting grain, and wipe in first coat of stain before cutting. Now select best pieces for folding top, sides, and doors. Use well-matched pieces for doors. Spring catches hold doors closed.

TRULY unique in design is this combination bookcase and writing desk. When made of select Ponderosa pine and finished in brown mahogany it is an attractive piece of furniture for any living room or study. Cut out and assemble the bookcases first, countersinking all screw holes so that they may be covered later with wood filler. Make the desk part next, following the dimensions in the plans. After fitting all hardware, remove the handles and hinges, sand all over, then apply one or two more coats of stain. Apply one coat of shellac, sand when dry, then paint all edges with quick-drying black enamel. Now cover everything with at least two coats of good varnish, carefully rubbing down the first coat. Furniture wax will preserve the gloss.


7½"
WRITING DESK AND DOOR LET DOWN
SEE DETAIL "B"
5" RADIUS
3"
HINGE
BOOK SHELF
HINGE
CLEAT
REAR SHELF
7"
BOOK SHELF
28"
34"
SHELF
11½"
19½"
12½"


FASTEN MALE UNIT TO BACK BOARD —FEMALE TO BOTTOM OF TOP SHELF
DETAIL "B"
WRITING DESK CATCH
SPRING TO HOLD REAR EDGE OF TOP SHELF
3/8"
1"
2"
BOTTOM DOOR HANDLE

Build your desk to dimensions shown above. Special spring catch holds writing desk in closed position. Small turnbuttons of brass, like those used on window screens, hold desk in open position for writing. Door handles are turned from 3/8" brass rod. Drill mounting holes with No. 33 drill, tap with No. 6-32, and use 6-32 screws. Use brass tubing as spacers over bolts. Lacquer all hardware to retain lustre.

PITCH MARBLES To BATTER

by RALPH T. MOORE

This indoor version of the great American baseball game has all of the plays, all of the thrills of a World Series event, yet is really simple and inexpensive to construct in your workshop.

SKILL rather than luck determines the winner of a nine-inning baseball game played on this novel board. Each player, taking his turn at pitching, can deliver to the batter slow balls, fast ones, or even a curved ball. Both pitching cup and batting arm are controlled by pull-buttons at opposite sides of the board. A steel ball bearing ½-inch in diameter is the baseball.

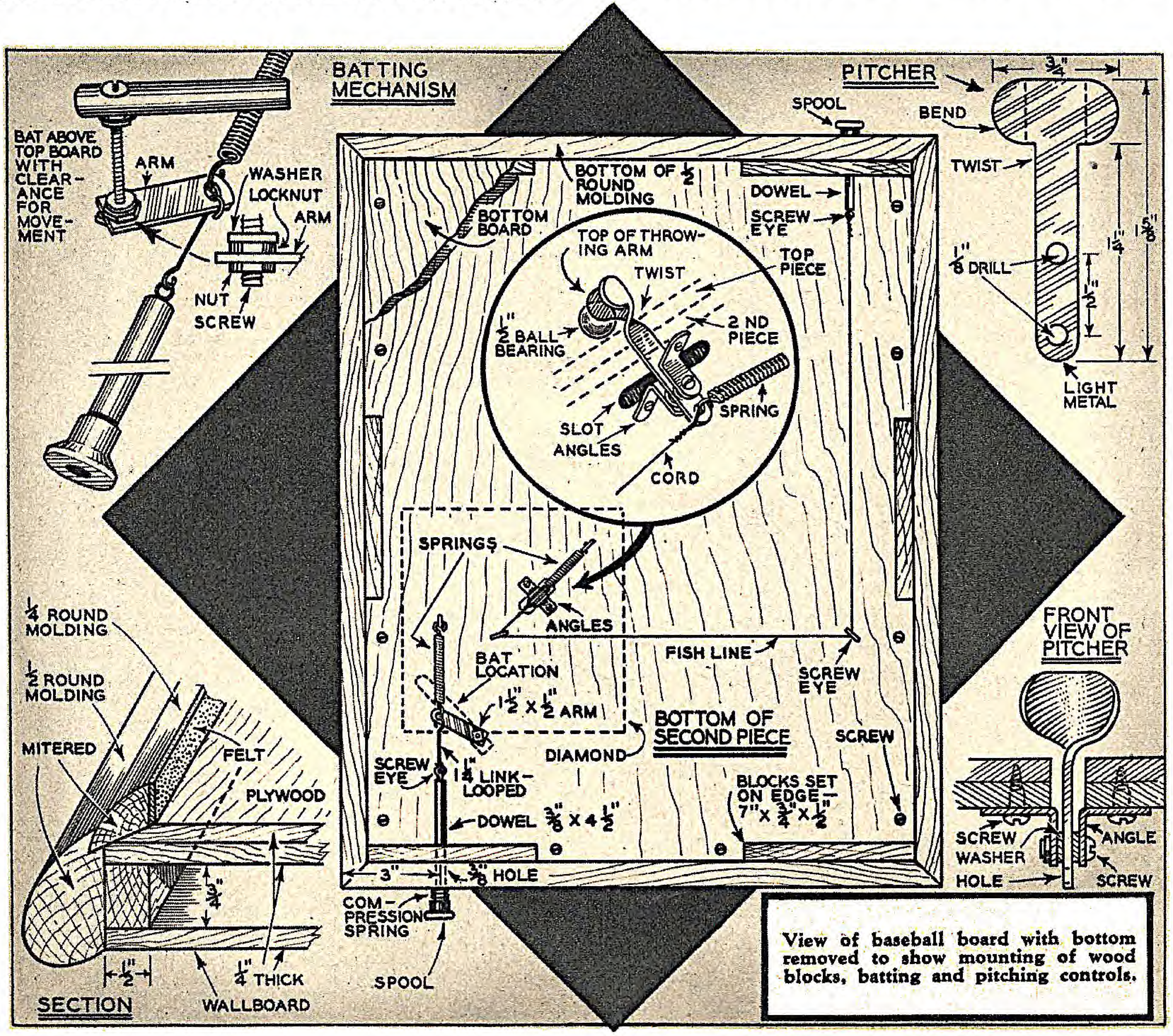
One piece of plywood 19″x24″ is marked out for the playing board. With a 1″ drill make the ends of the slots, finishing with a key-hole saw. The corner slots are cut with the saw. File the edges of the slots slightly, then sand smooth. Drill ¼″ holes in the center of each base location, and three of the same size in the runners' dugout.

Paint the board a light green. When dry paint in the base and foul lines as shown, and outline all of the holes and slots in black.

Quarter-round moulding ¾″ on a side is now mitered and screwed to the board around all sides, the curved edges out, to form a fence which keeps the ball on the board.

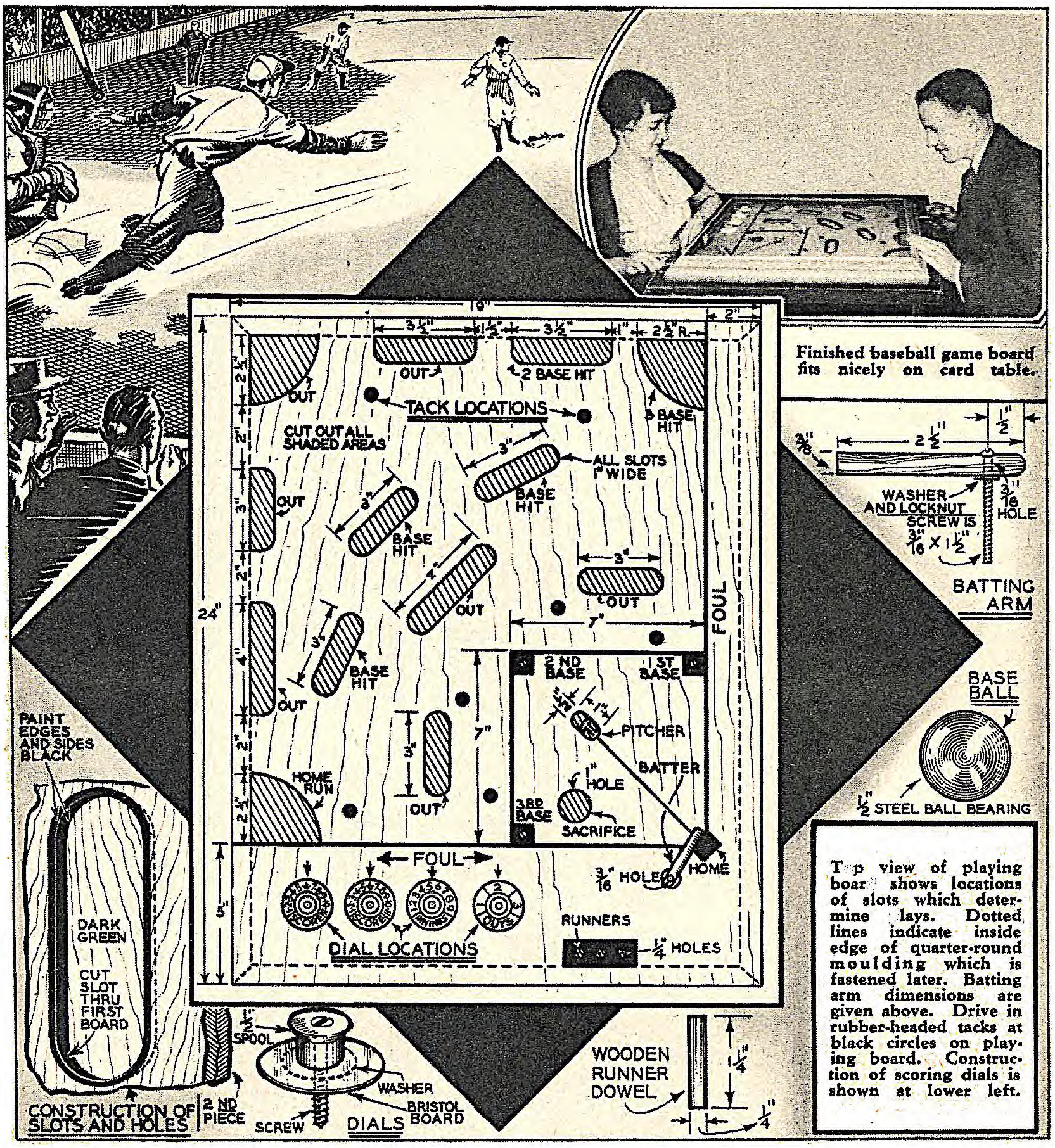
Place this playing field on another piece of plywood of the same size and drill holes as indicated in the sketches for the pitching arm and the batting arm. Paint the top of this board a dark green, as it will show through the holes in the playing board.

Fasten six 7″x¾″x½″ pine blocks to the bottom board by screws through the top, and screw 1½″ diameter half-round


BATTING MECHANISM
BAT ABOVE TOP BOARD WITH CLEARANCE FOR MOVEMENT
ARM
WASHER
LOCKNUT
ARM
NUT
SCREW
PITCHER
SPOOL
BEND
¾″
TWIST
1⅝″
1¼″
½″
⅛″ DRILL
LIGHT METAL
BOTTOM OF ½ ROUND MOLDING
DOWEL
SCREW EYE
TOP PIECE
BOTTOM BOARD
TOP OF THROWING ARM
TWIST
½″ BALL BEARING
2 ND PIECE
SPRING
SLOT ANGLES
CORD
SPRINGS
ANGLES
FISH LINE
BAT LOCATION
1½″ x ½″ ARM
SCREW EYE
BOTTOM OF SECOND PIECE
SCREW
DIAMOND
SCREW EYE
1¼″ LINK-LOOPED
DOWEL ⅜ x 4½″
BLOCKS SET ON EDGE— 7″x ¾″x ½″
3″
⅜″ HOLE
COM-PRESSION SPRING
SPOOL
¼ ROUND MOLDING
½ ROUND MOLDING
MITERED
FELT
PLYWOOD
¾″
½″
¼″ THICK WALLBOARD
SECTION
FRONT VIEW OF PITCHER
SCREW
WASHER
HOLE
ANGLE
SCREW

View of baseball board with bottom removed to show mounting of wood blocks, batting and pitching controls.

On BASEBALL GAME BOARD


19"
3½"
1½"
3½"
1"
2½ R.
2"
OUT
2 BASE HIT
OUT
TACK LOCATIONS
3 BASE HIT
CUT OUT ALL SHADED AREAS
3"
ALL SLOTS 1" WIDE
BASE HIT
3"
OUT
BASE HIT
4"
OUT
3"
OUT
24"
7"
FOUL
3"
BASE HIT
OUT
2 ND BASE
1 ST BASE
PITCHER
BATTER
1" HOLE
HOME RUN
3"
OUT
7"
3RD BASE
SACRIFICE
FOUL
3/16" HOLE
HOME
5"
SCORE
SCORE
INNINGS
OUTS
DIAL LOCATIONS
RUNNERS
¼" HOLES
3/8"
2½"
½"
WASHER AND LOCKNUT SCREW IS 3/16" X 1½"
3/16 HOLE
BATTING ARM
BASE BALL
½" STEEL BALL BEARING
PAINT EDGES AND SIDES BLACK
DARK GREEN
CUT SLOT THRU FIRST BOARD
CONSTRUCTION OF SLOTS AND HOLES
2 ND PIECE
½"
SPOOL
WASHER
BRISTOL BOARD
SCREW
DIALS
WOODEN RUNNER DOWEL
1¼"
¼"

Finished baseball game board fits nicely on card table.

Top view of playing board shows locations of slots which determine plays. Dotted lines indicate inside edge of quarter-round moulding which is fastened later. Batting arm dimensions are given above. Drive in rubber-headed tacks at black circles on playing board. Construction of scoring dials is shown at lower left.

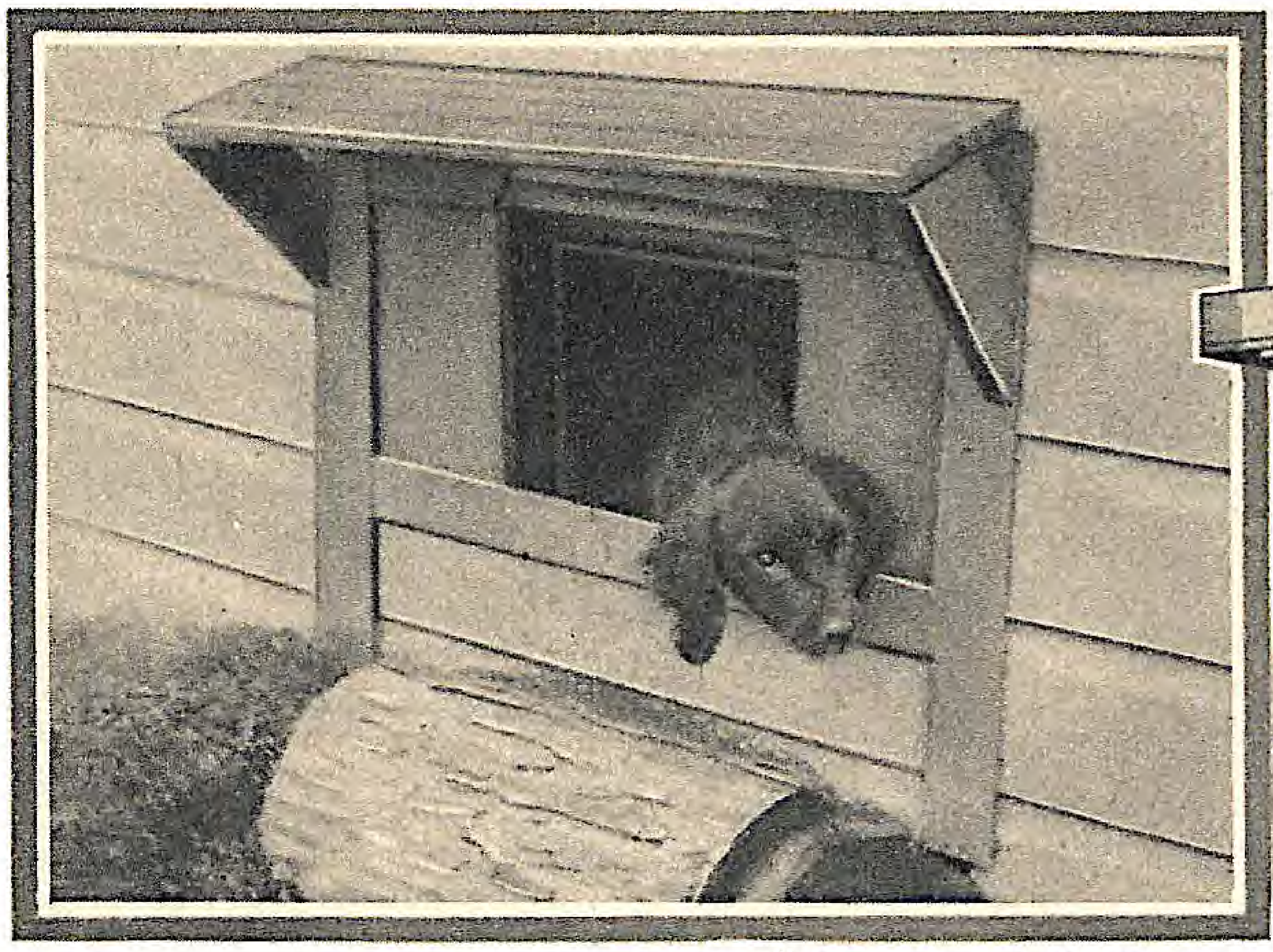
moulding to the blocks all around the board to form the sides. The plywood pieces are now fastened together with small screws around the edges. Nail a piece of wallboard to the blocks for a bottom covering.

Regular baseball rules apply to this game whenever you are in doubt as to a play. Remember that a runner (peg) hit by a batted ball (ball bearing) is out. A ball driven over the fence and off the board is a foul ball. Batter is out if the ball hits the pitching arm. Pitched balls not crossing home plate are called balls—runner walks after four of these, as in regular baseball.

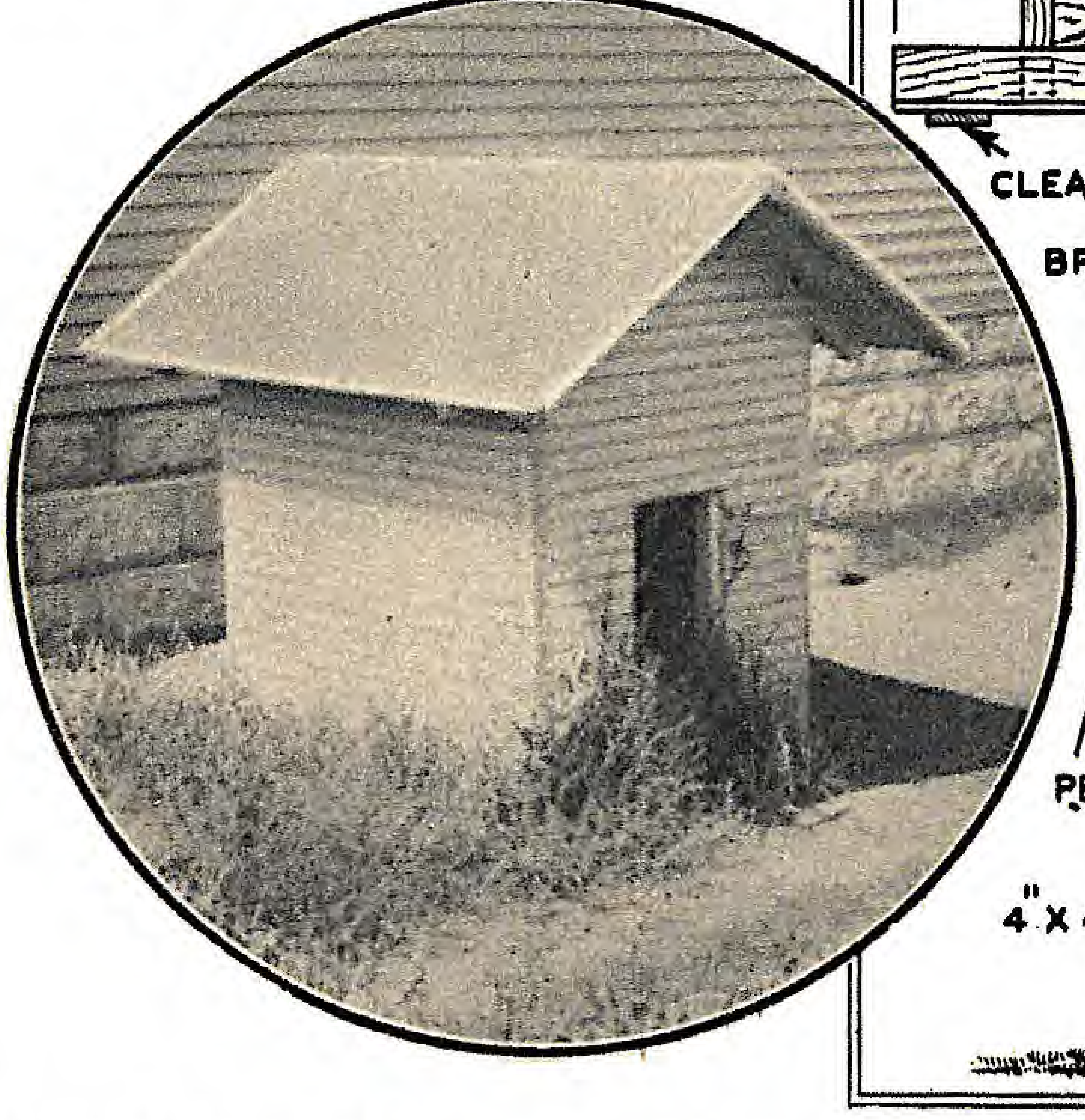
The game board is just the right size to fit on an ordinary card table. Players either change position after each inning, or turn the board around. The marking dials record the score, eliminating need for paper score pad and pencil.

Strikes and balls are called as play progresses, there being no need to keep a record of them. A score better than eight for nine innings is exceptional.

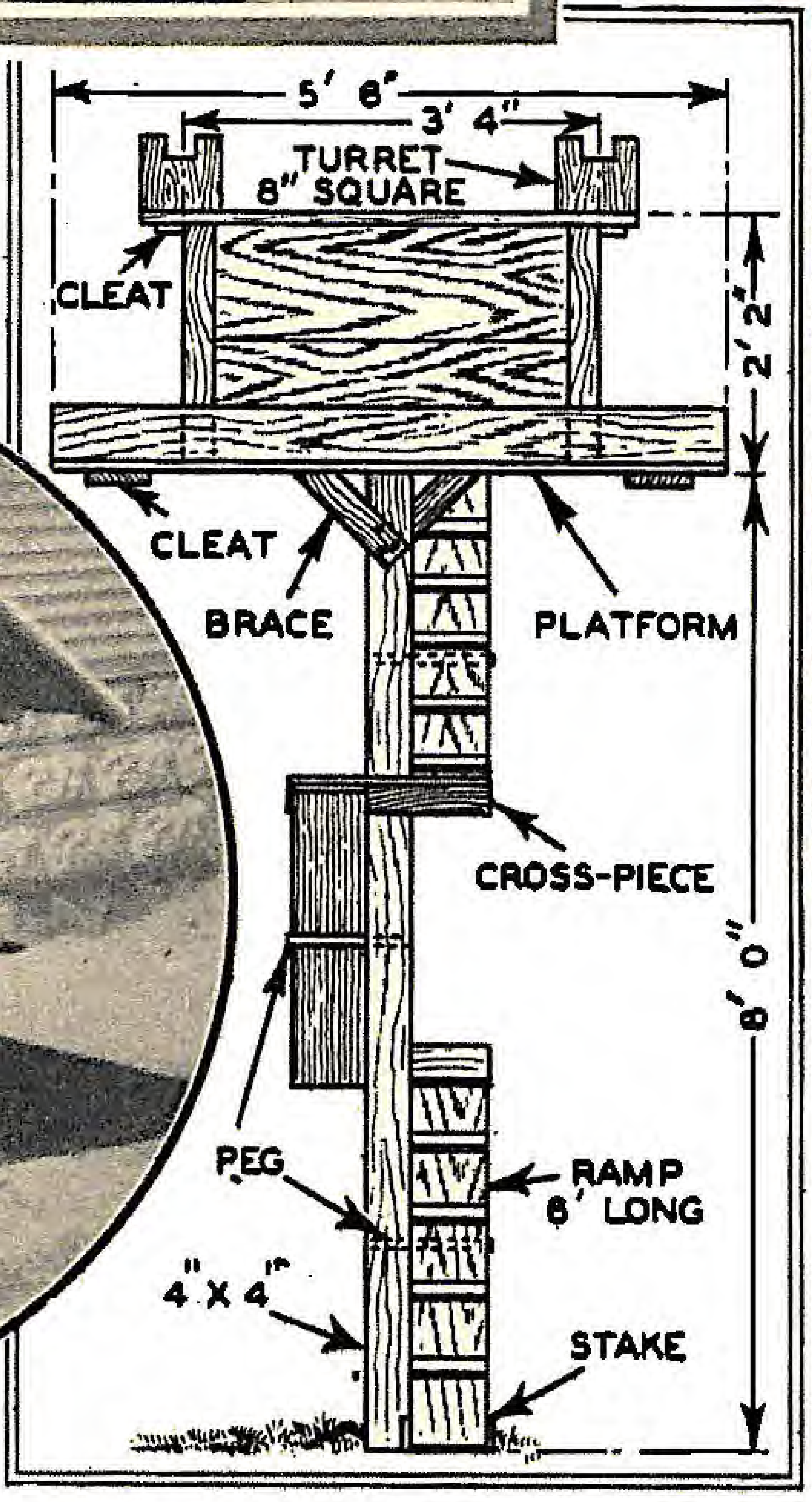
For Your Dog—Three Inexpensive Houses

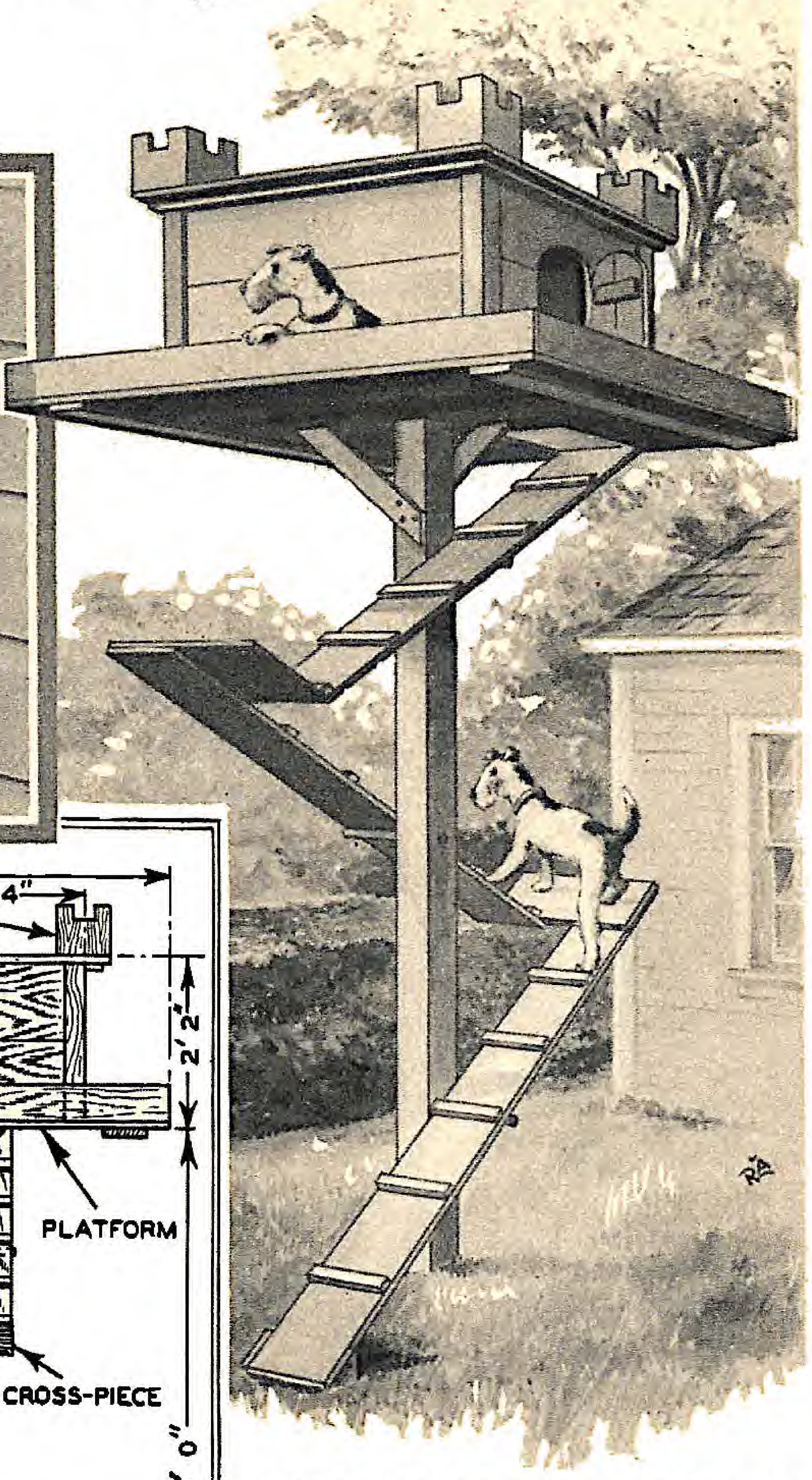


This puppy looks suspiciously at the photographer from his fine little home built into the back of the garage. If garage is heated and wood door used, dog can stay in this all through winter.



Somewhere around premises can be found a suitable place for a dog house—if you have a dog. This house was made from left-over wainscoting and a bit of roofing paper. Be sure to use false bottom of boards, raised a few inches above ground.





Little bits of meat placed on cleats of ramp will entice your dog up to this pup penthouse the first time; after that he'll thoroughly enjoy climbing ramps to reach the breezy platform. Platform and house are square, with necessary dimensions for small dog given at right. Cover roof with tar paper; small slant here will help water to drain off. Make ornamental door and nail open as shown. House and ramp must be strong and well-braced.

YOUR dog will thoroughly enjoy a penthouse home, set high above the ground in the shade of a tree, during those hot summer days. Teach him to climb the ramp by placing bits of meat on the cleats and at the top—he'll soon learn to go up alone.

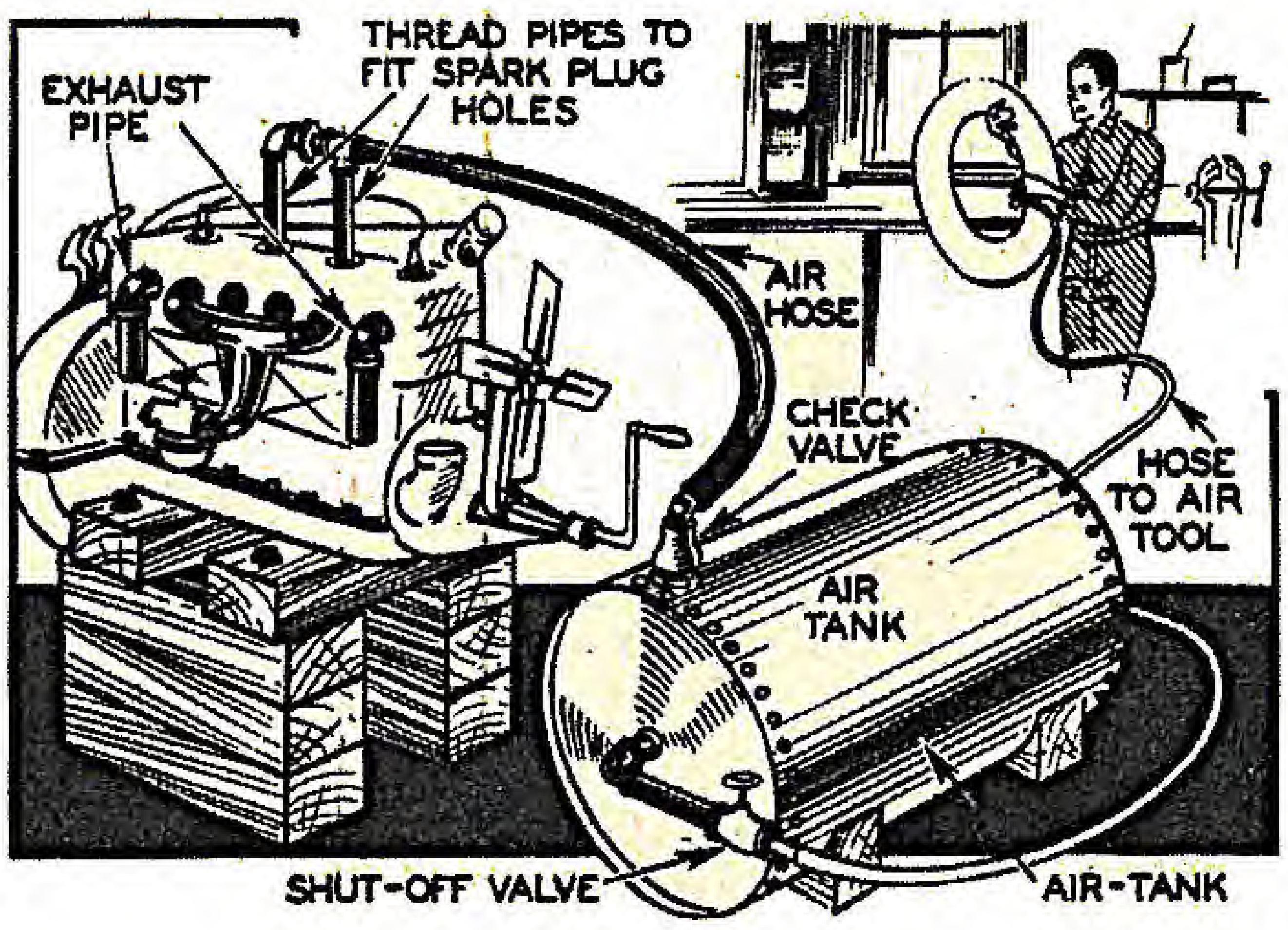
The penthouse dimensions given here are for a puppy or small dog. If your dog is bigger, simply add a few inches to each dimension. The 4"x4" support post should rise at least 8' above the ground, with the 5½' square platform solidly fastened to the top. Dimensions of the kennel castle are not important—just be sure that there is enough room inside for the dog and that the door is large enough.

A dog house built into the back of your garage will be more comfortable in winter than an outside house. Simply cut a door through the wall, set a large wood box against this hole on the inside, and build a neat portico and frame around the entrance. A burlap-covered frame will do for a door in summer; in winter a swinging wood door will be better.

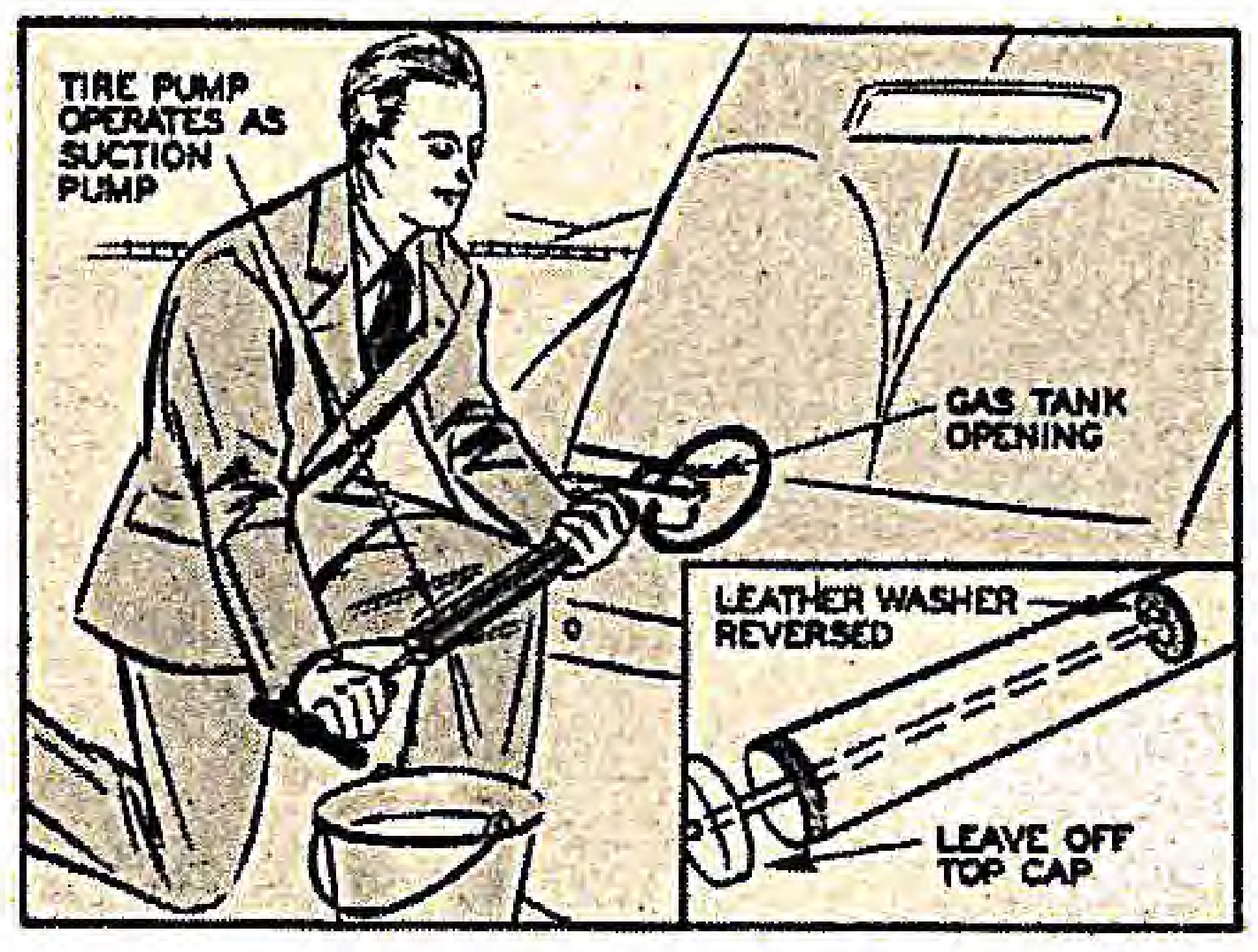
AUTOMOTIVE KINKS

Auto Engine Is Air Compressor

AN AIR compressor which generates its own power can be made from any old four-cylinder auto engine. Two cylinders act as engine, and two compress the air, delivering a steady pressure of 50 lbs. Remove the exhaust manifold, and replace with pipes on the cylinders that are firing. Use the intake manifold as it is, shortening the stems of the compressor intake valves so they do not move. If the firing order is 1-3-4-2, cylinders 2 and 3 are used as compressors.—John Stark.


EXHAUST PIPE
THREAD PIPES TO FIT SPARK PLUG HOLES
AIR HOSE
CHECK VALVE
HOSE TO AIR TOOL
AIR TANK
SHUT-OFF VALVE
AIR-TANK

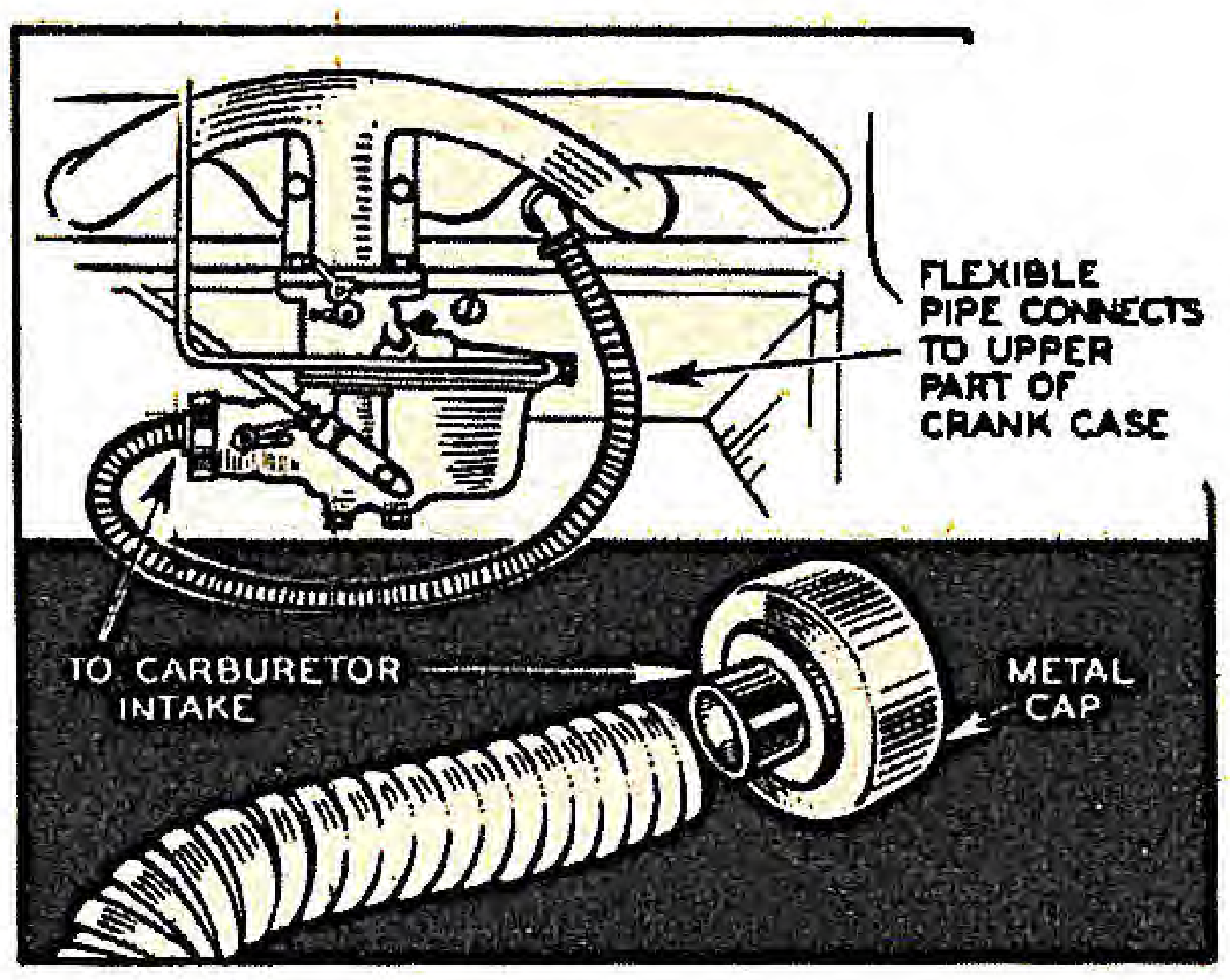
Remove Gasoline from Tank With Tire Pump


TIRE PUMP OPERATES AS SUCTION PUMP
GAS TANK OPENING
LEATHER WASHER REVERSED
LEAVE OFF TOP CAP

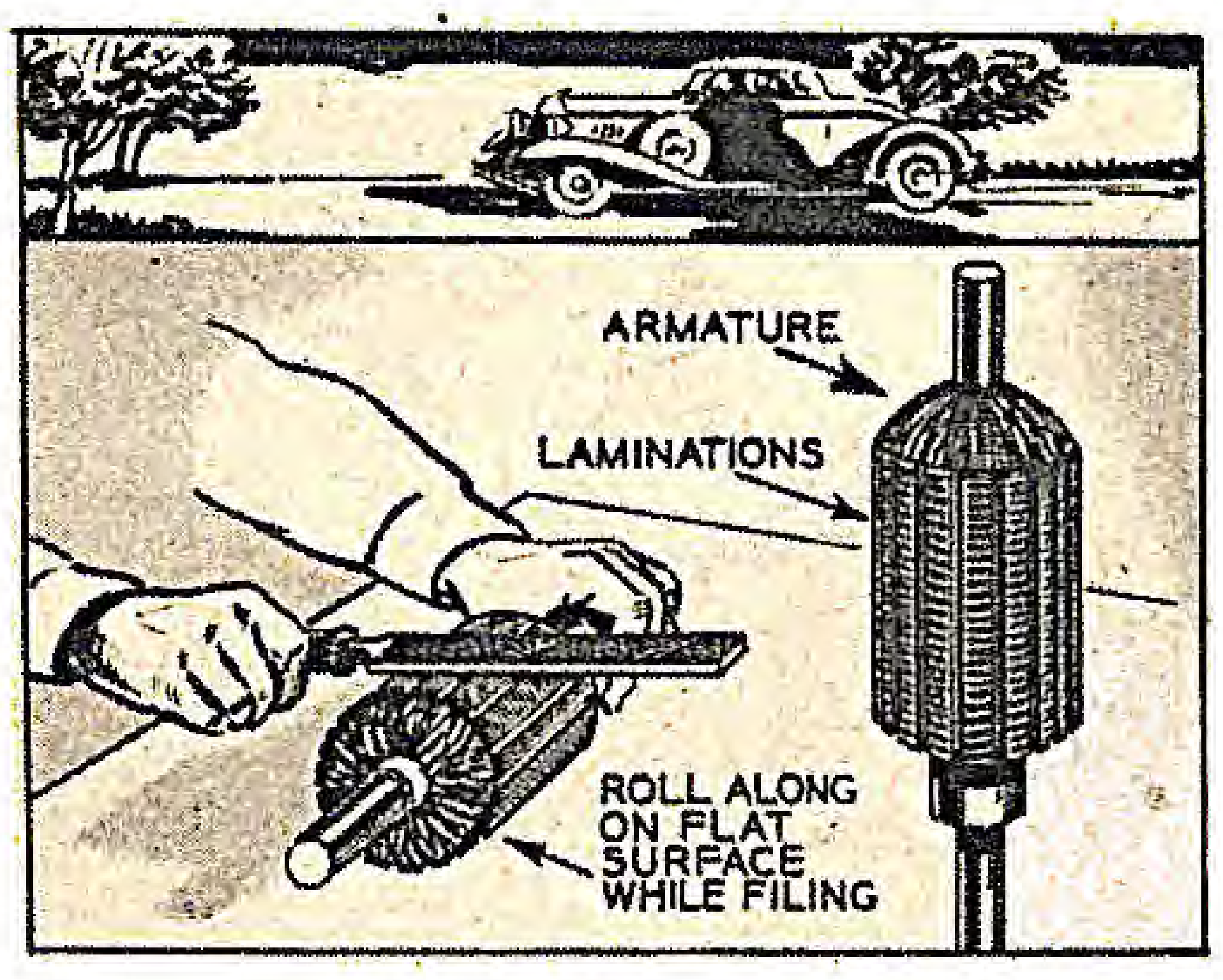
IN EMERGENCIES gasoline can be removed from your auto tank with an ordinary tire pump. Take out the plunger and reverse the leather washer mounted on its end. Now by leaving the top cap off you have a suction pump. Hold the pump at a downward angle near a pail as shown, and liquid can be pumped out of the top. To use without reversing the leather, draw gas into the pump, then transfer the hose from tank to pail and pump out the liquid.—R. F. Jennings.

Supercharger Made from Tubing Saves Gas

A SIMPLE form of supercharger which obtains air from the valve chamber will reduce gas consumption on many of the older types of automobiles. The carburetor air inlet is connected to this chamber by a flexible metal tube, a hole being punched in the valve pan cover and a flange soldered on to take the tubing. The compression created by the pistons on their downward stroke forces air into the carburetor, the amount being proportional to the speed.—Richard Evans.


FLEXIBLE PIPE CONNECTS TO UPPER PART OF CRANK CASE
TO CARBURETOR INTAKE
METAL CAP

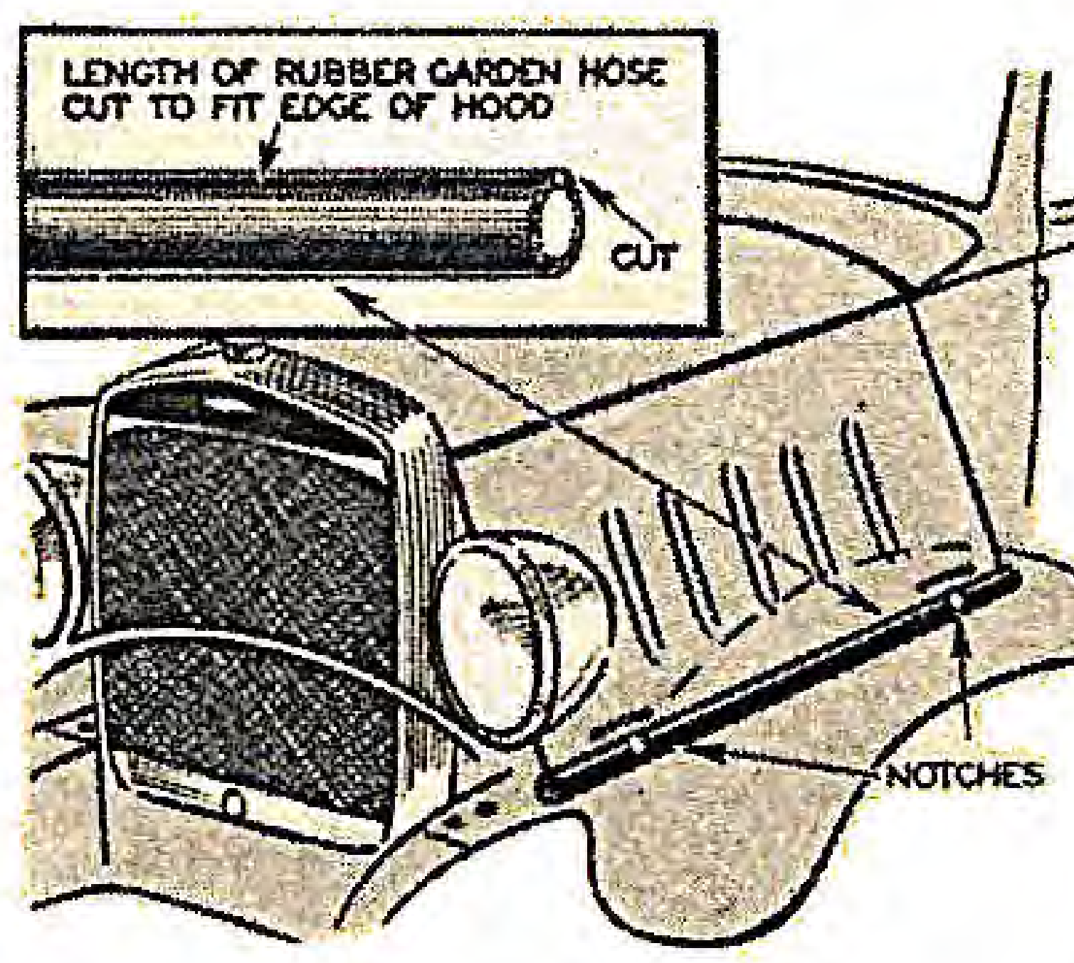
Putting New Pep Into Your Starter Motor


ARMATURE
LAMINATIONS
ROLL ALONG ON FLAT SURFACE WHILE FILING

OFTENTIMES it is wear in the armature shaft and bearings of a starter that allows the armature to drag on the field poles, with a resultant loss in power. To remedy this, remove the armature and file down all the laminations about 1/64". Be careful not to file too deep, or you will scrape the wires in the slots. Brush off all filings with a stiff brush, replace the armature, and give it a tryout.—A. H. Waychoff.

Split Garden Hose Stops Rattling of Engine Hood

ONE of the loudest and most annoying of auto rattles is that of the engine hood. This may be stopped effectively by slitting lengths of garden hose or thick rubber tubing to slip over the rolled bottom edge of the hood on each side of the car. Cut notches in the hose for the hold-down clips, since they are used as before.—H. W. Arthur.


LENGTH OF RUBBER GARDEN HOSE CUT TO FIT EDGE OF HOOD
CUT
NOTCHES

Completing Midget Miller

by WESTON FARMER

PART II

"MIDGET MILLER," scale model of the famous Miller dirt track racers, provides plenty of thrills at 20 miles an hour. It is just the thing for midget car racing and with its novel clutch system can be used in the heaviest traffic of city streets.

In Part I we completed the frame. This month we will complete the entire car.

The springing of "Midget Miller" is ingenious. It consists of two long leaves in front bolted with two 5/16" s. a. e. nickel steel bolts to the spring perch as shown in Fig. 3. Small top leaves can be put in to help the reflex springing, but they are not necessary.

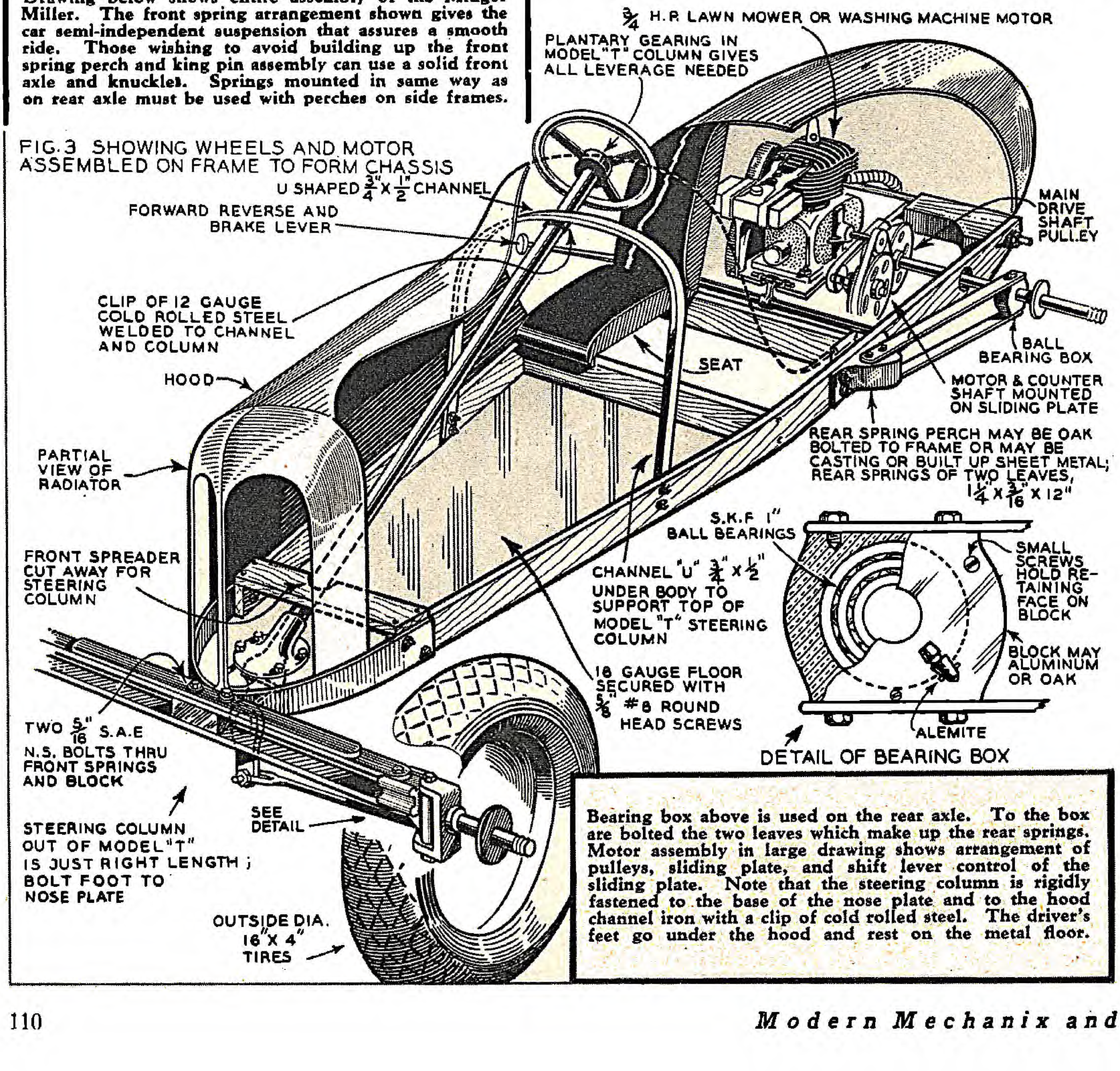
The ends of these springs are bolted to the king pin landings, shown in detail in Fig. 6. The king pins shown in the photos were cast of bronze and the stub shafts themselves were therefore bronze, eliminating the necessity of bronze bushings in the front wheels. Fig. 6, however, shows a method of building up the king pin assembly.

A small block of metal 1¼" high, 2" wide has welded to its end a piece of one inch cold rolled shafting 3" long to receive the king pin. A small gusset (triangular) plate is welded between the solid spring landing and the king pin shafting to strengthen the assembly. The king pin shaft is bored for the ¼" nickel steel king pin bolt.

The spindle assembly is bent from 3/16" strap as shown and drilled for the bolt. Then the stub shaft can be centered through a hole

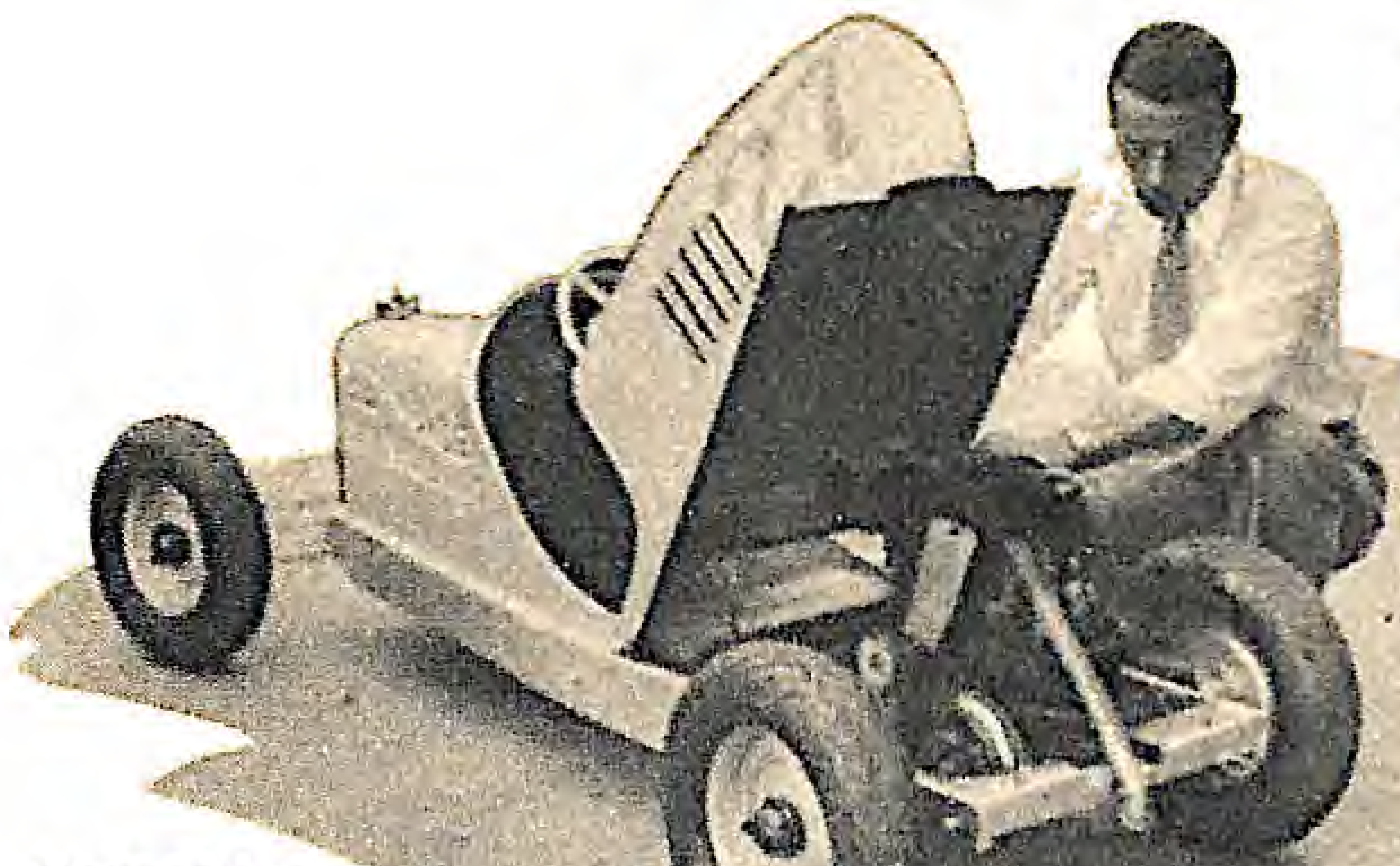
Drawing below shows entire assembly of the Midget Miller. The front spring arrangement shown gives the car semi-independent suspension that assures a smooth ride. Those wishing to avoid building up the front spring perch and king pin assembly can use a solid front axle and knuckles. Springs mounted in same way as on rear axle must be used with perches on side frames.

FIG. 3 SHOWING WHEELS AND MOTOR ASSEMBLED ON FRAME TO FORM CHASSIS


¾ H.P. LAWN MOWER OR WASHING MACHINE MOTOR
PLANTARY GEARING IN MODEL "T" COLUMN GIVES ALL LEVERAGE NEEDED
U SHAPED ¾"X½" CHANNEL
FORWARD REVERSE AND BRAKE LEVER
MAIN DRIVE SHAFT PULLEY
CLIP OF 12 GAUGE COLD ROLLED STEEL WELDED TO CHANNEL AND COLUMN
BALL BEARING BOX
SEAT
HOOD
MOTOR & COUNTER SHAFT MOUNTED ON SLIDING PLATE
REAR SPRING PERCH MAY BE OAK BOLTED TO FRAME OR MAY BE CASTING OR BUILT UP SHEET METAL; REAR SPRINGS OF TWO LEAVES, 1¼"X3/16"X12"
PARTIAL VIEW OF RADIATOR
S.K.F 1" BALL BEARINGS
SMALL SCREWS HOLD RETAINING FACE ON BLOCK
FRONT SPREADER CUT AWAY FOR STEERING COLUMN
CHANNEL "U" ¾"X½" UNDER BODY TO SUPPORT TOP OF MODEL "T" STEERING COLUMN
BLOCK MAY ALUMINUM OR OAK
18 GAUGE FLOOR SECURED WITH ⅝" #8 ROUND HEAD SCREWS
ALEMITE
TWO 5/16" S.A.E N.S. BOLTS THRU FRONT SPRINGS AND BLOCK
DETAIL OF BEARING BOX
STEERING COLUMN OUT OF MODEL "T" IS JUST RIGHT LENGTH; BOLT FOOT TO NOSE PLATE
SEE DETAIL
OUTSIDE DIA. 16"X 4" TIRES

Bearing box above is used on the rear axle. To the box are bolted the two leaves which make up the rear springs. Motor assembly in large drawing shows arrangement of pulleys, sliding plate, and shift lever control of the sliding plate. Note that the steering column is rigidly fastened to the base of the nose plate and to the hood channel iron with a clip of cold rolled steel. The driver's feet go under the hood and rest on the metal floor.

—Model Dirt Track Racer



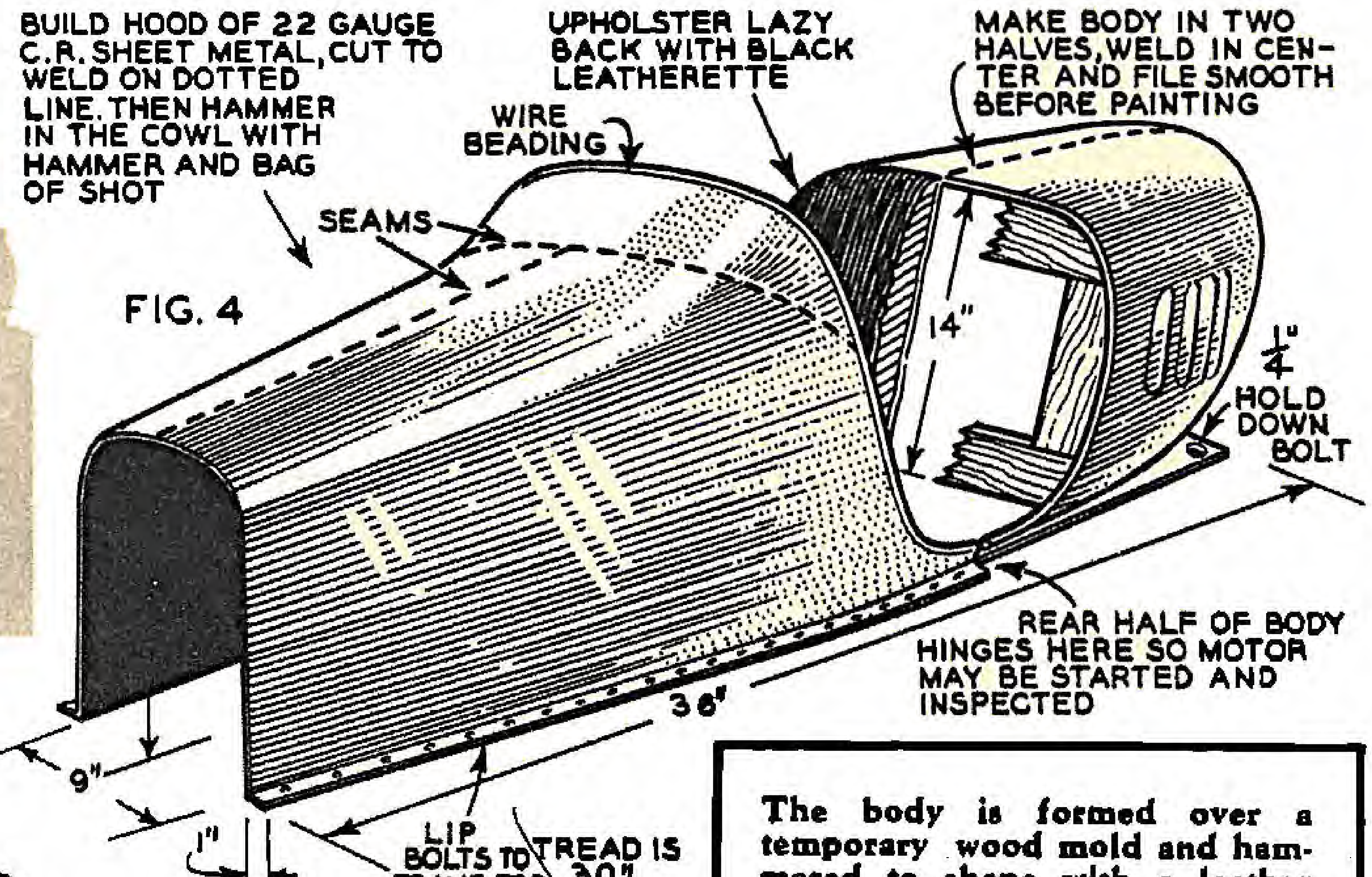

BUILD HOOD OF 22 GAUGE C.R. SHEET METAL, CUT TO WELD ON DOTTED LINE. THEN HAMMER IN THE COWL WITH HAMMER AND BAG OF SHOT
SEAMS
WIRE BEADING
UPHOLSTER LAZY BACK WITH BLACK LEATHERETTE
MAKE BODY IN TWO HALVES, WELD IN CENTER AND FILE SMOOTH BEFORE PAINTING
14"
¼" HOLD DOWN BOLT
REAR HALF OF BODY HINGES HERE SO MOTOR MAY BE STARTED AND INSPECTED
36"
9"
1"
LIP
BOLTS TO FRAME TOP
TREAD IS 30"

FIG. 4

The body is formed over a temporary wood mold and hammered to shape with a leather faced hammer. Seams shown are welded since vibration will crack solder. Rear half hinges.

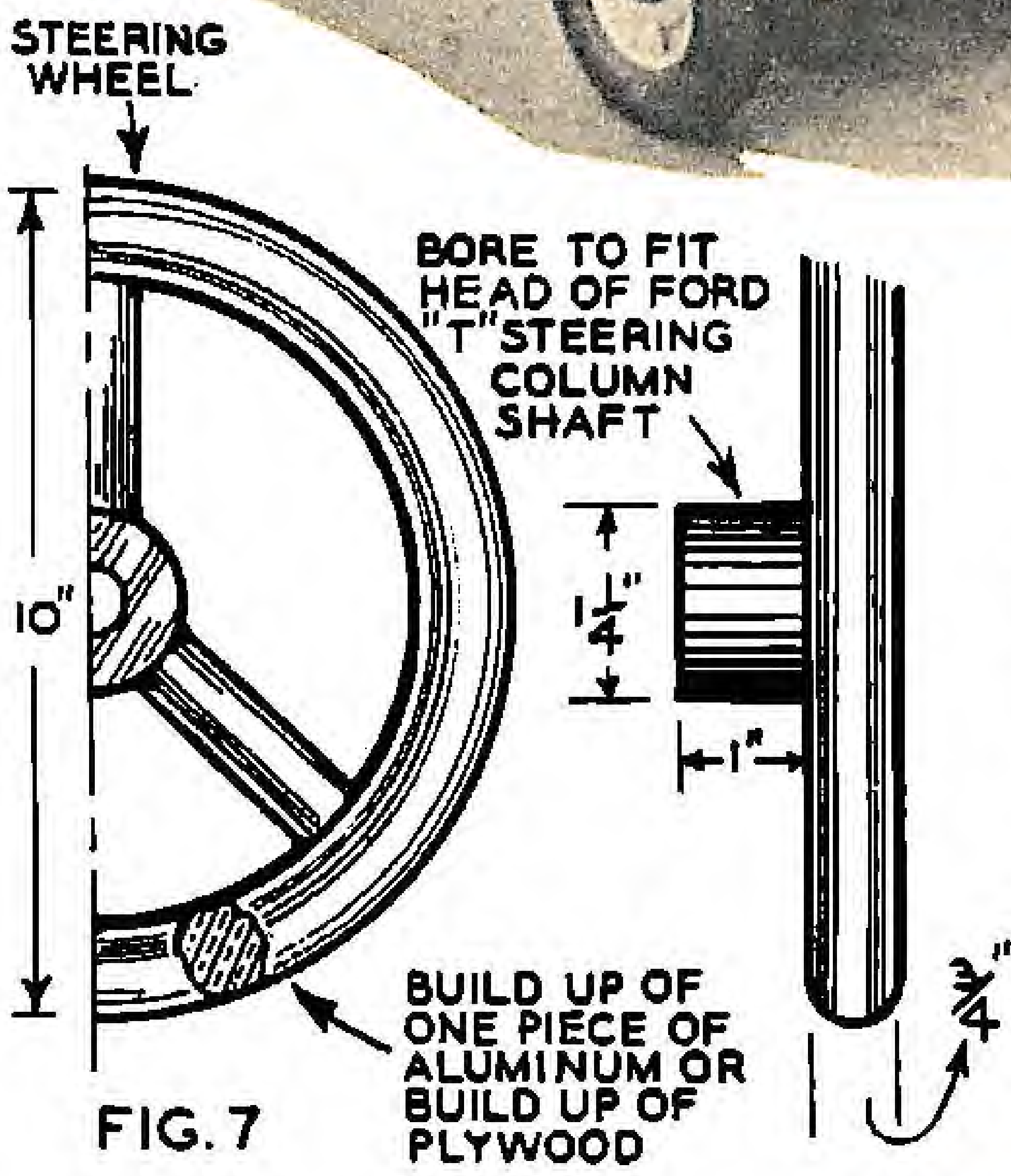

STEERING WHEEL
BORE TO FIT HEAD OF FORD "T" STEERING COLUMN SHAFT
1¼"
1"
10"
¾"
BUILD UP OF ONE PIECE OF ALUMINUM OR BUILD UP OF PLYWOOD

FIG. 7

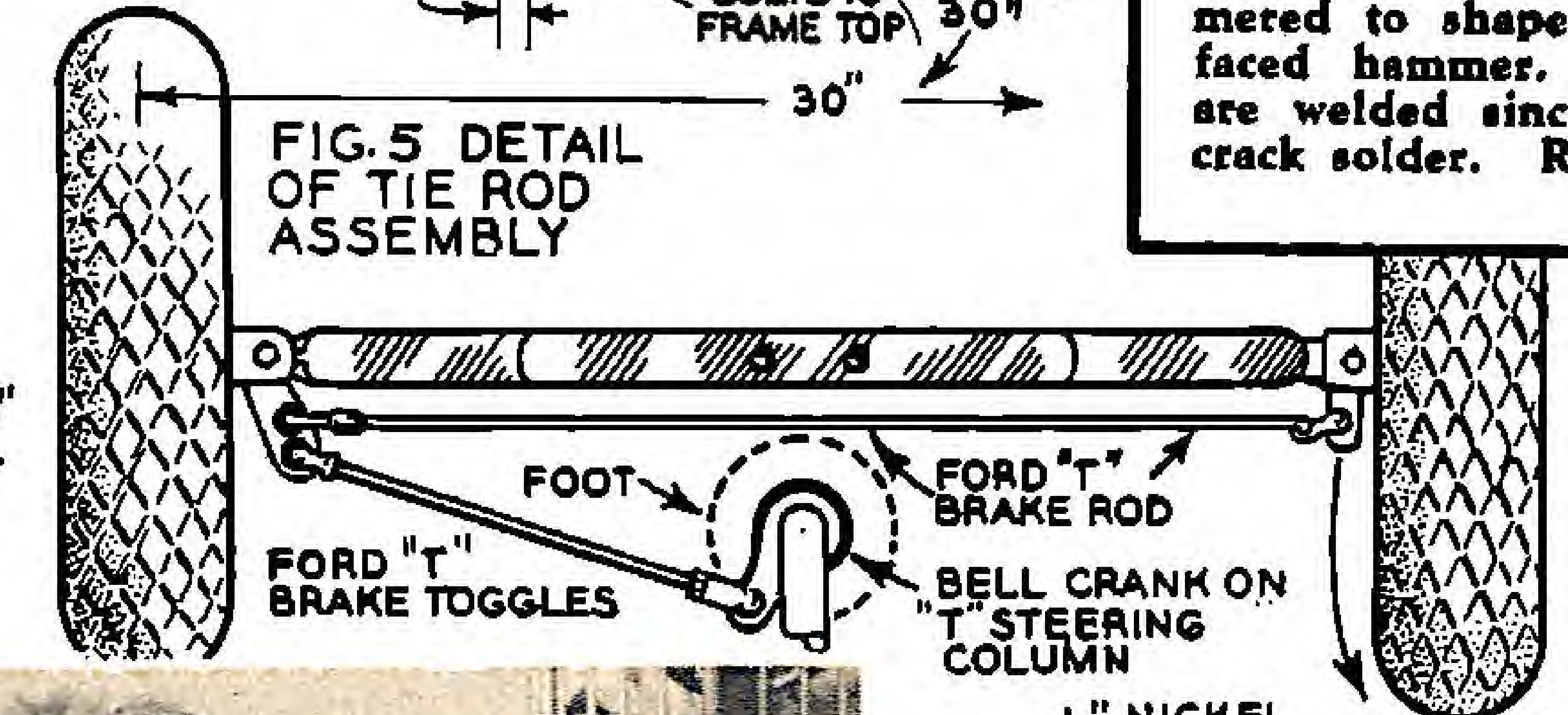

30"
FOOT
FORD "T" BRAKE ROD
FORD "T" BRAKE TOGGLES
BELL CRANK ON "T" STEERING COLUMN

FIG. 5 DETAIL OF TIE ROD ASSEMBLY

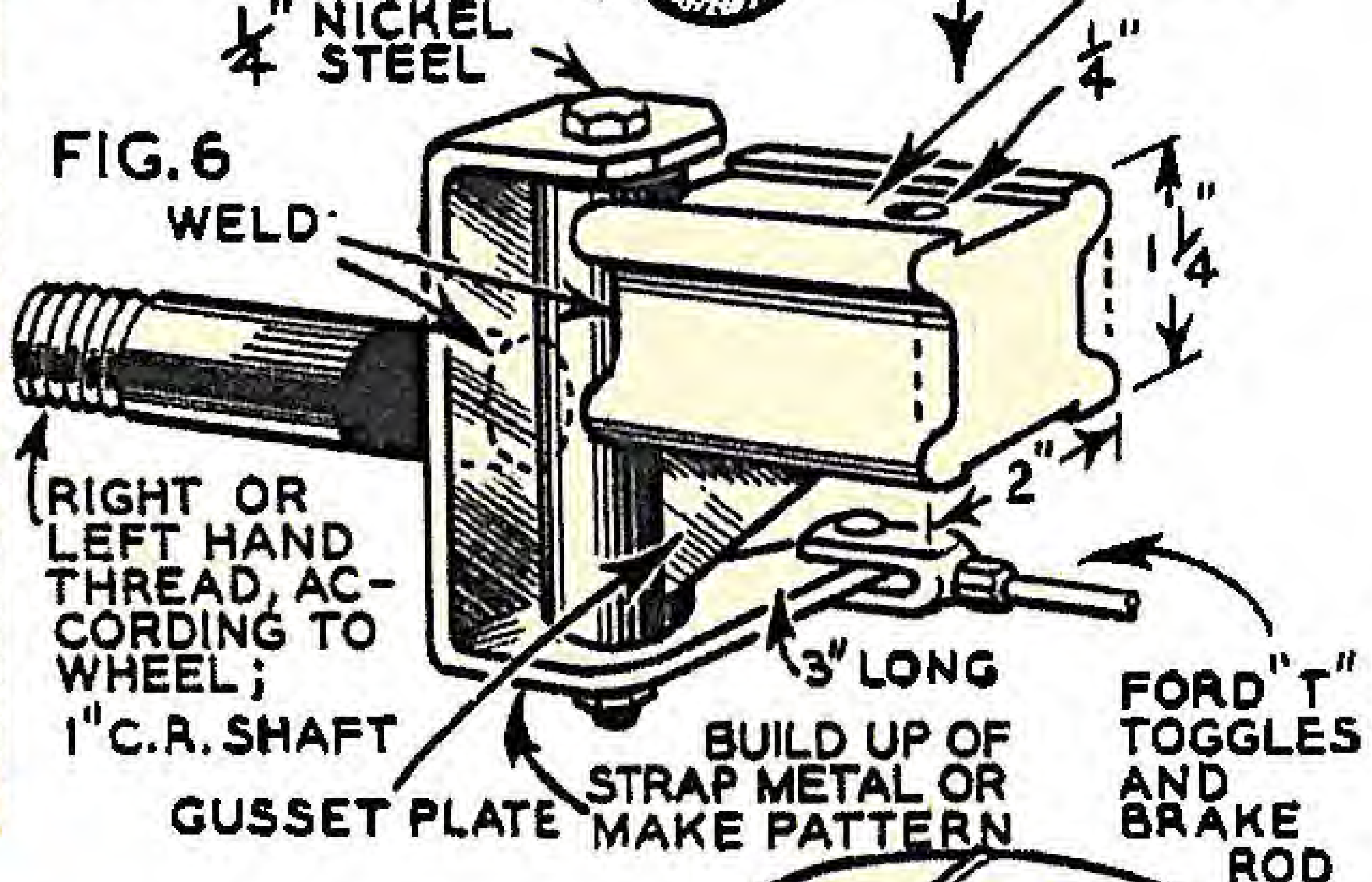
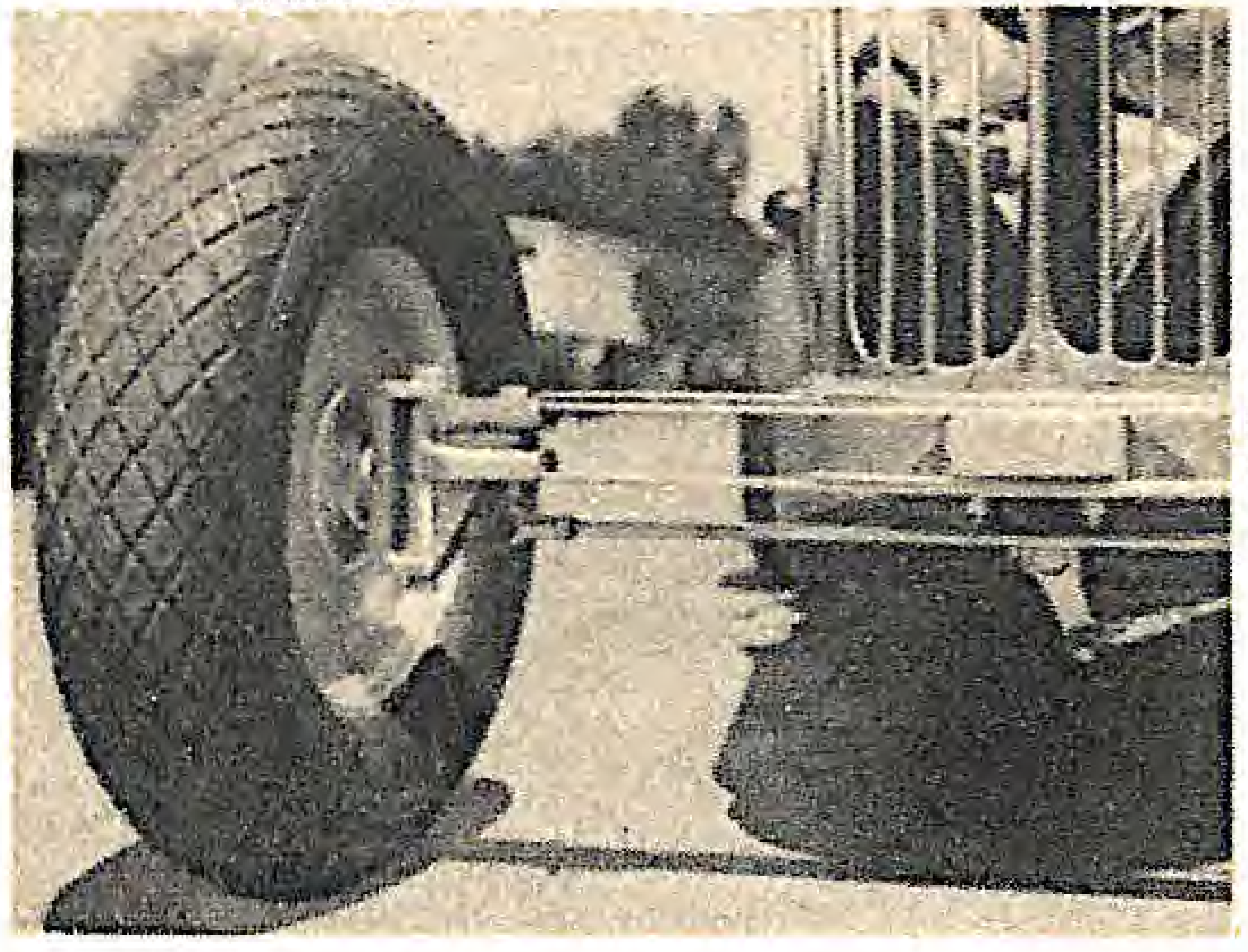

SPRING LANDING MAY BE CAST OR MACHINED FROM SOLID AS PER DOTTED LINE
GROOVE FOR SPRING
¼"
¼" NICKEL STEEL
WELD
1¼"
2"
RIGHT OR LEFT HAND THREAD, ACCORDING TO WHEEL; 1" C.R. SHAFT
3" LONG
BUILD UP OF STRAP METAL OR MAKE PATTERN
GUSSET PLATE
FORD "T" TOGGLES AND BRAKE ROD

FIG. 6

Photo at top shows how rear half of body can be lifted to inspect motor, while photo at right is a closeup of the front spring perch and king pin detail. Ford T steering wheel can be used or a three-spoke wheel cast of aluminum or built up of plywood as shown in Fig. 7. Fig. 5 shows the front assembly. In building the left hand king pin, Fig. 6, make the extension arm 5" long to hold tie and connecting rods.



drilled for it and welded or brazed in. The wheels must be fitted with bronze bushings. Each wheel should be locked on with a double lock nut and the shaft threaded so that the nut tends to tighten in the direction of wheel rotation.

The tie rods are Ford Model T brake rods and brake rod toggles to make a connection between the bell crank at the end of the steering column and the king pins. See Fig. 5.

The rear wheels are a simple assembly. A double V pulley 8" in diameter (Fig. 9) is placed on the rear axle after it is threaded through one of the axle holes in the frame. The pulley is locked in place with set screws.

The rear springs are 1¼"x3/16"x12" spring steel. They are led from the spring perch at the side of the frame, which may be a wood block of oak or a cast perch. Two 5/16" bolts through the block will hold the springs to the car frame securely. The rear ends are mounted on a block which holds the 1" s. k. f. ball bearings. These blocks (Fig. 3) are either of oak or may be aluminum blocks machined out. Their function is to anchor the springs and hold the ball bearings through which the shaft runs. It is wise too, to

The radiator shell at right is built up of two halves of 22 gauge c.r. sheet metal. Brass bars are soldered on to form the grid. The entire shell can be nickel plated. In king pin assembly, Fig. 6, the spring landing can be left square or machined. The assembly shown is for the right hand wheel. Model T toggles and brake rods are used for the tie rod assembly as shown in Fig. 5 above.

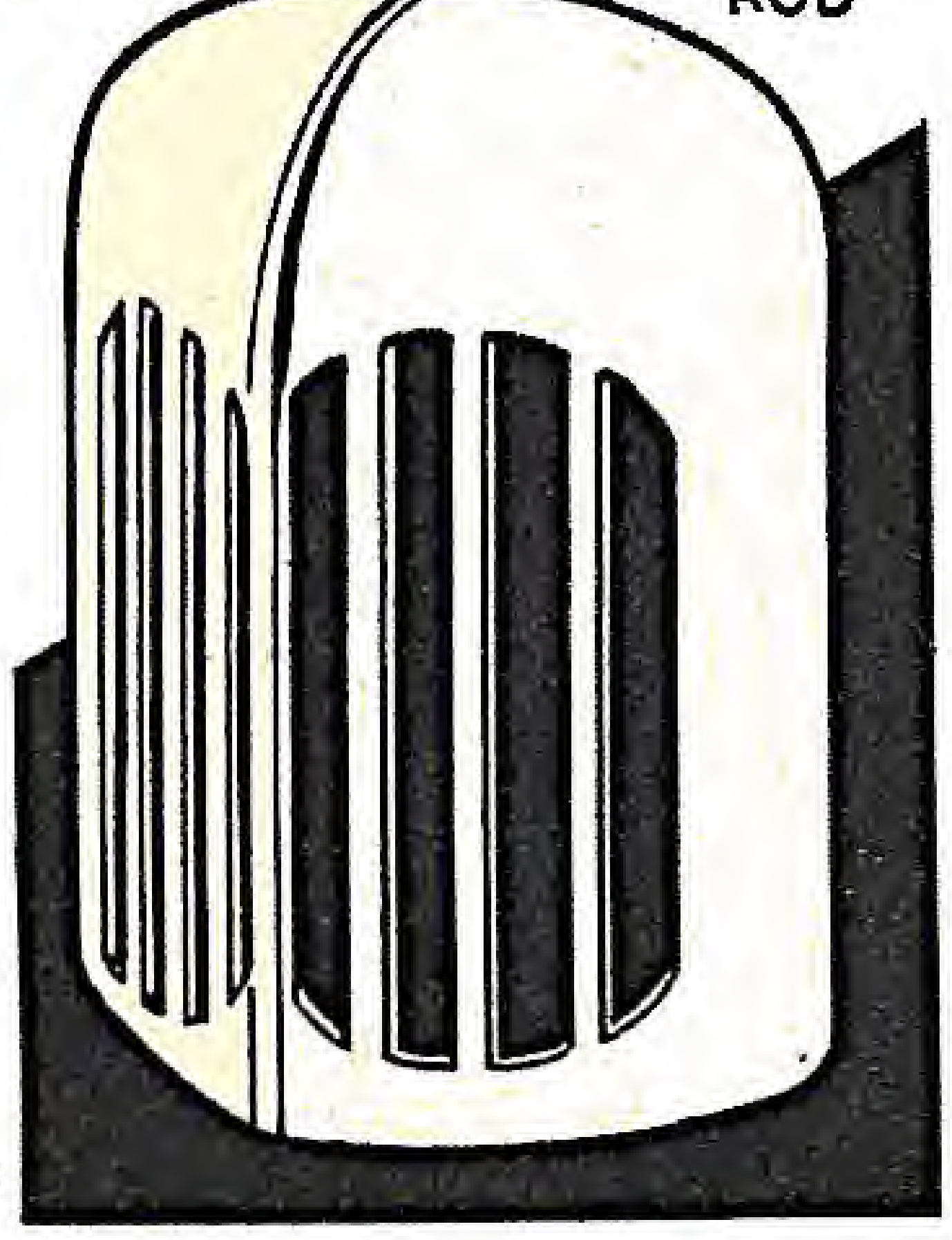
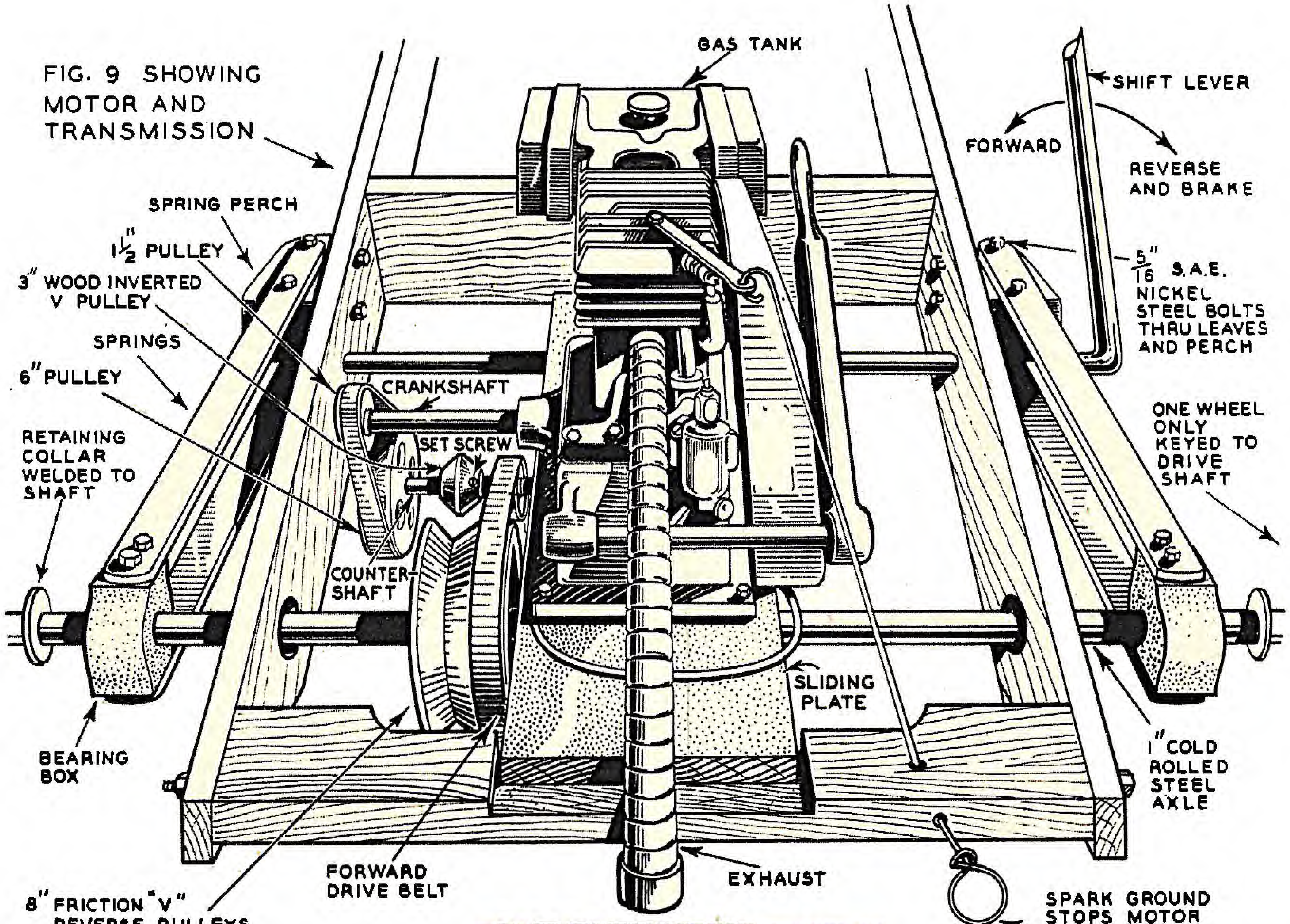

BRASS BARS, SOLDERED IN, NICKEL PLATED

FIG. 8

Novel Pulley Arrangement Gives Midget Car Forward and Reverse Shift

FIG. 9 SHOWING MOTOR AND TRANSMISSION


GAS TANK
SHIFT LEVER
FORWARD
REVERSE AND BRAKE
SPRING PERCH
1½" PULLEY
3" WOOD INVERTED V PULLEY
SPRINGS
6" PULLEY
CRANKSHAFT
SET SCREW
RETAINING COLLAR WELDED TO SHAFT
COUNTER-SHAFT
5/16" S.A.E. NICKEL STEEL BOLTS THRU LEAVES AND PERCH
ONE WHEEL ONLY KEYED TO DRIVE SHAFT
SLIDING PLATE
1" COLD ROLLED STEEL AXLE
BEARING BOX
FORWARD DRIVE BELT
EXHAUST
8" FRICTION "V" REVERSE PULLEYS
SPARK GROUND STOPS MOTOR

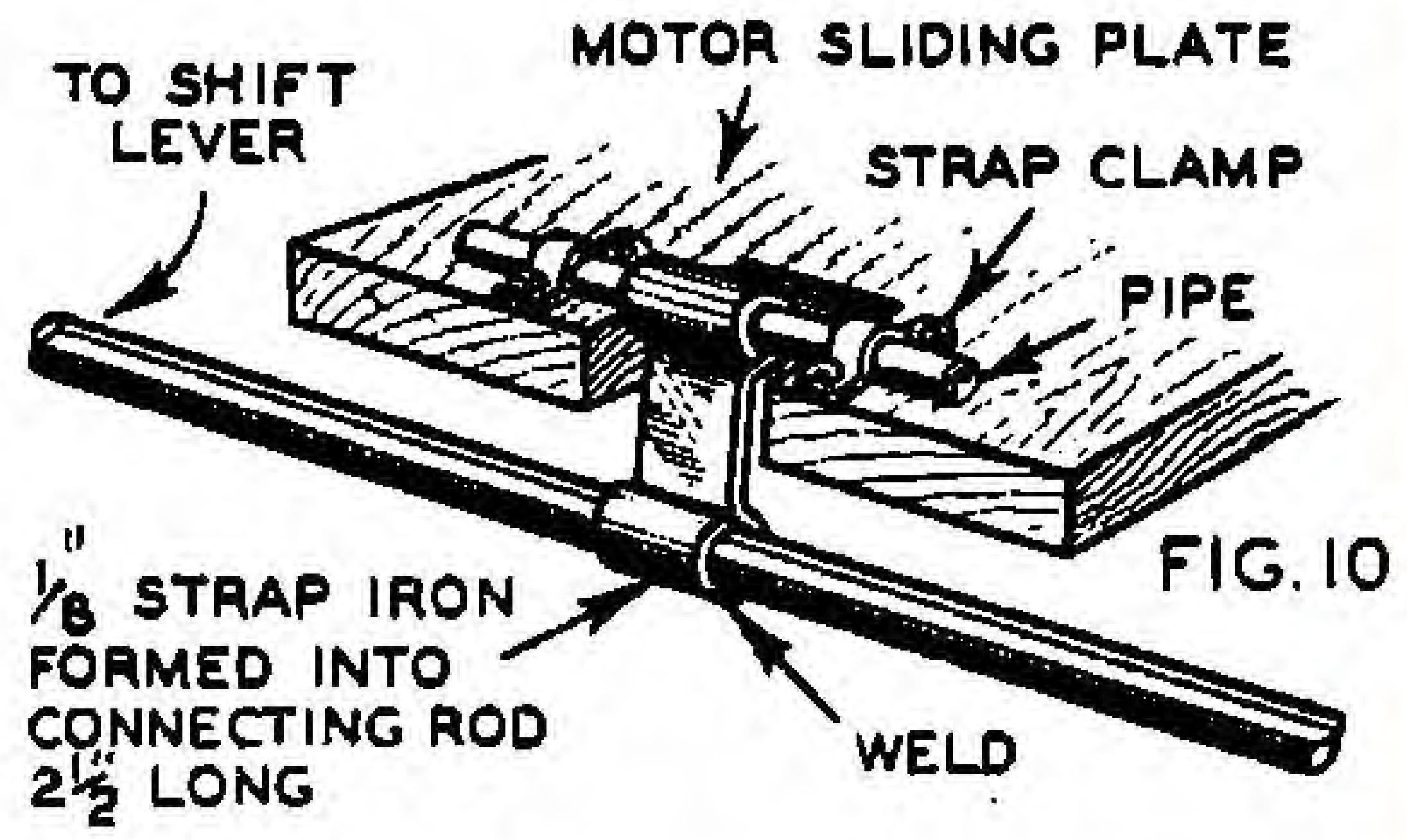
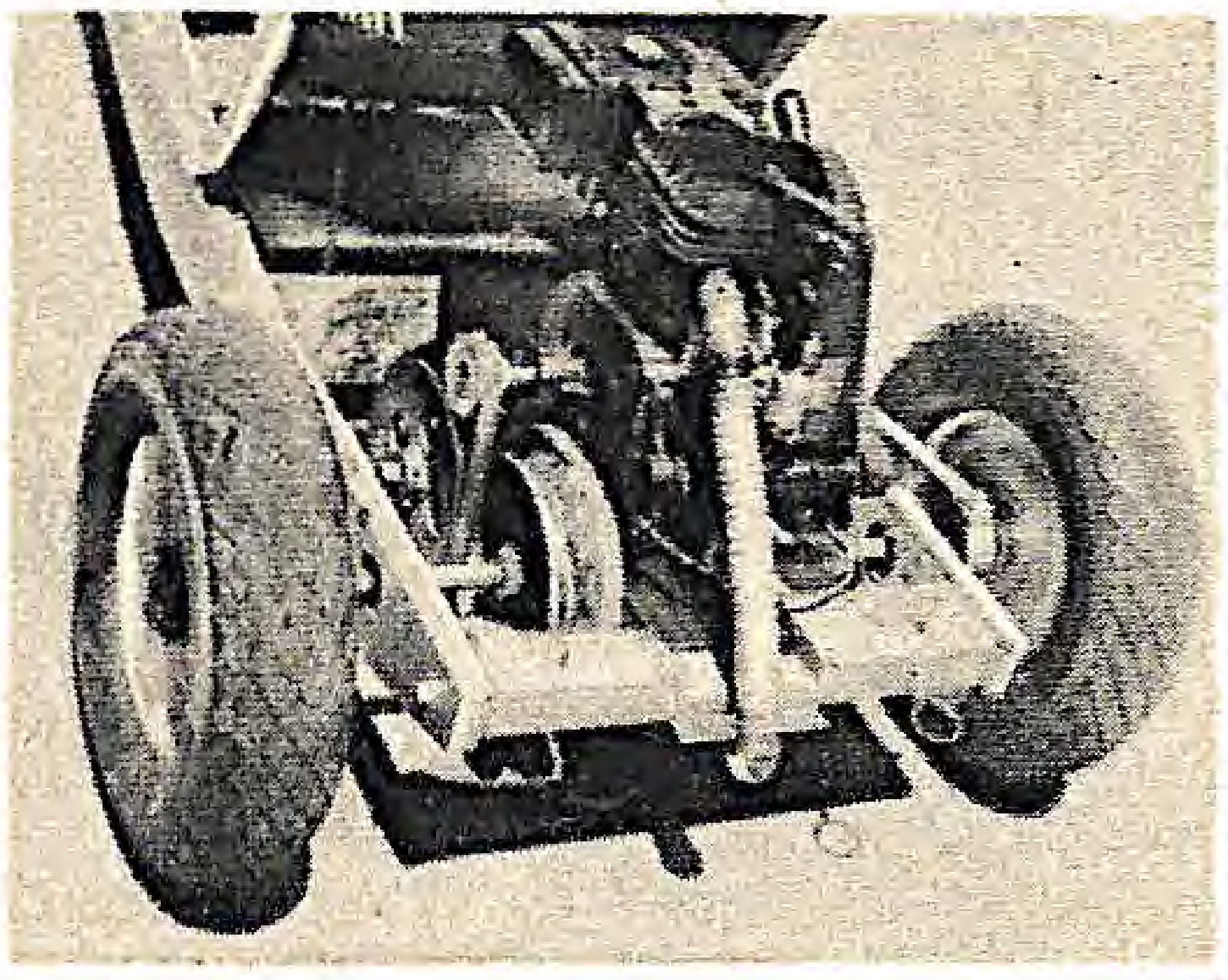
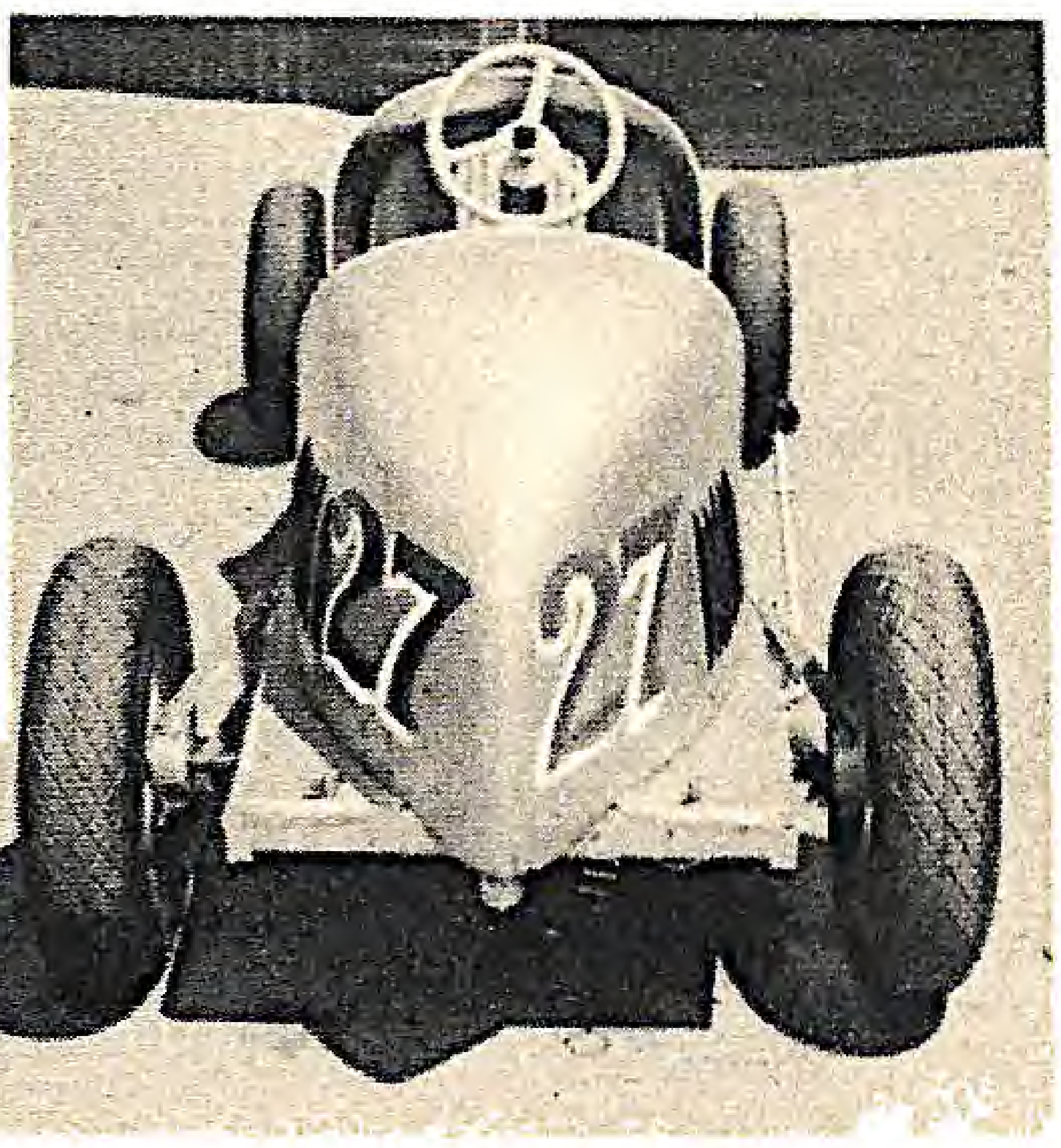

TO SHIFT LEVER
MOTOR SLIDING PLATE
STRAP CLAMP
PIPE
1/8" STRAP IRON FORMED INTO CONNECTING ROD 2½" LONG
WELD

FIG. 10





Photos at right show two rear views of Midget Miller. Original had metal motor sliding plate, but one-inch hard wood will do. Above is detail of connecting rod, shift lever shaft and sliding plate with which forward, neutral, and reverse shifts are accomplished. Fig. 9 shows entire motor, pulley and rear spring assembly. When motor sliding plate is pushed back, inverted V pulley meshes with 8" pulley to reverse drive. At neutral neither pulley nor belt engage.

provide a retaining plate of 16 gauge material, with alemite connections so grease may be injected in the annular ball race. The detail in Fig. 3 makes this clear.

Only one wheel, and that is the right side, is fastened to the shaft. The other is free, furnishing differential action. The wheels shown on the car in the photos are 16"x4" Goodyear wheelbarrow wheels, without inner tubes. The makers of the tires furnish the wheels and all.

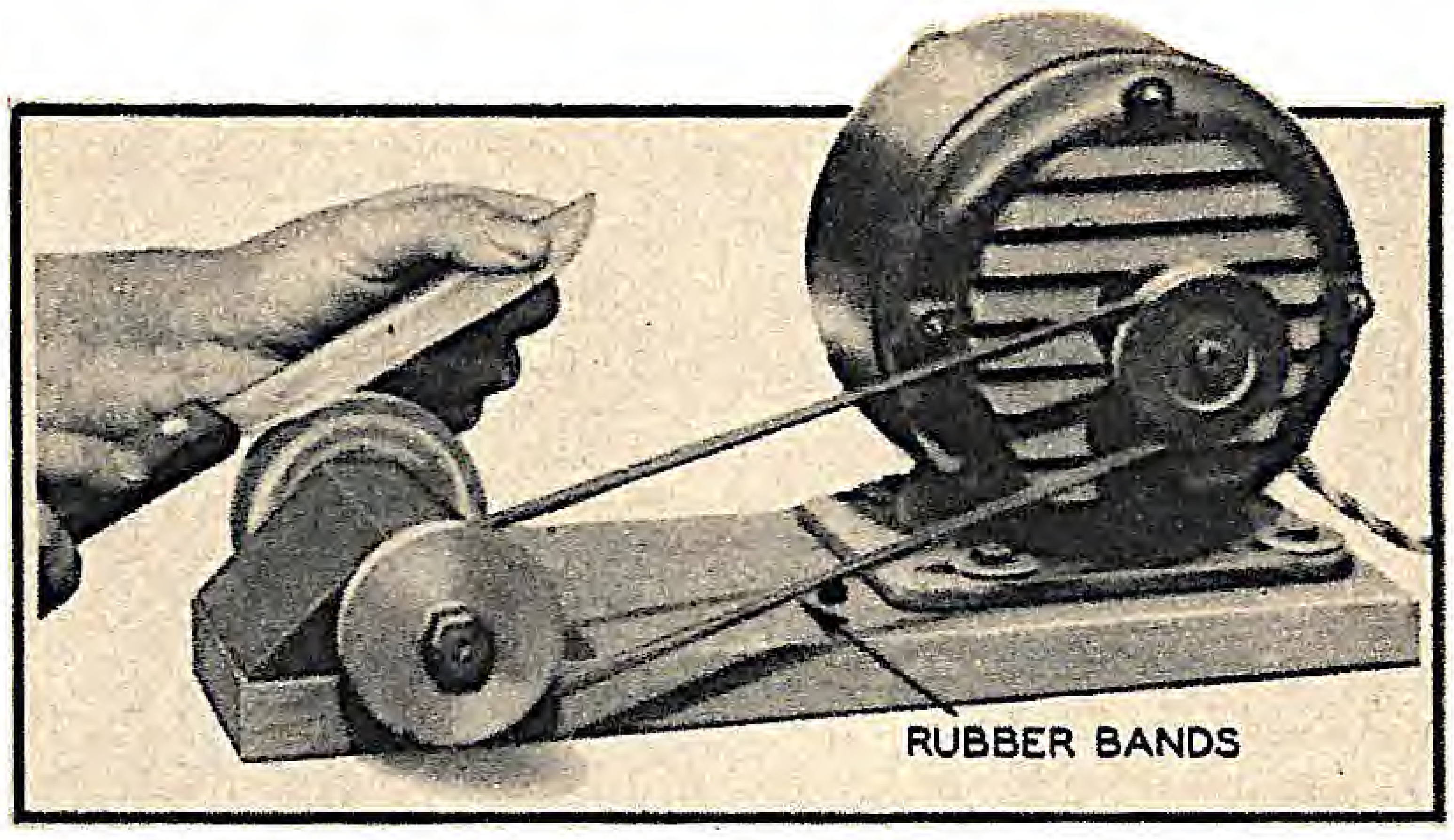
Now with the wheels in place, the chassis is complete. Let us look at the motor installation in Fig. 9. The motor shown is a ¾ h. p. Briggs and Stratton industrial motor. It is mounted on a sliding plate of 1" hardwood together with the countershaft. The motor drives a 6" pulley on the countershaft from a 1½" pulley on the crankshaft. The countershaft is mounted on bearings of strap iron fastened with woodscrews to the underside of the sliding plate.

The detail drawing in Fig. 9 shows how the sliding plate is controlled by the shift lever. A connecting rod 2½" long is formed from

[*Continued on page* 120]

Rubber Band Belts Give Perfect Tension

USING a rubber band as a belt, proper tension can be maintained at all times between motor and pulley, if the work being done is not too heavy to cause the band to slip or break. The bands consist of cross sections cut from a used inner tube, and they will handle all types of work that can be done with a quarter-horsepower motor. If fairly good rubber is used, the life of the belt is amazingly long. At any rate, replacement costs are small.

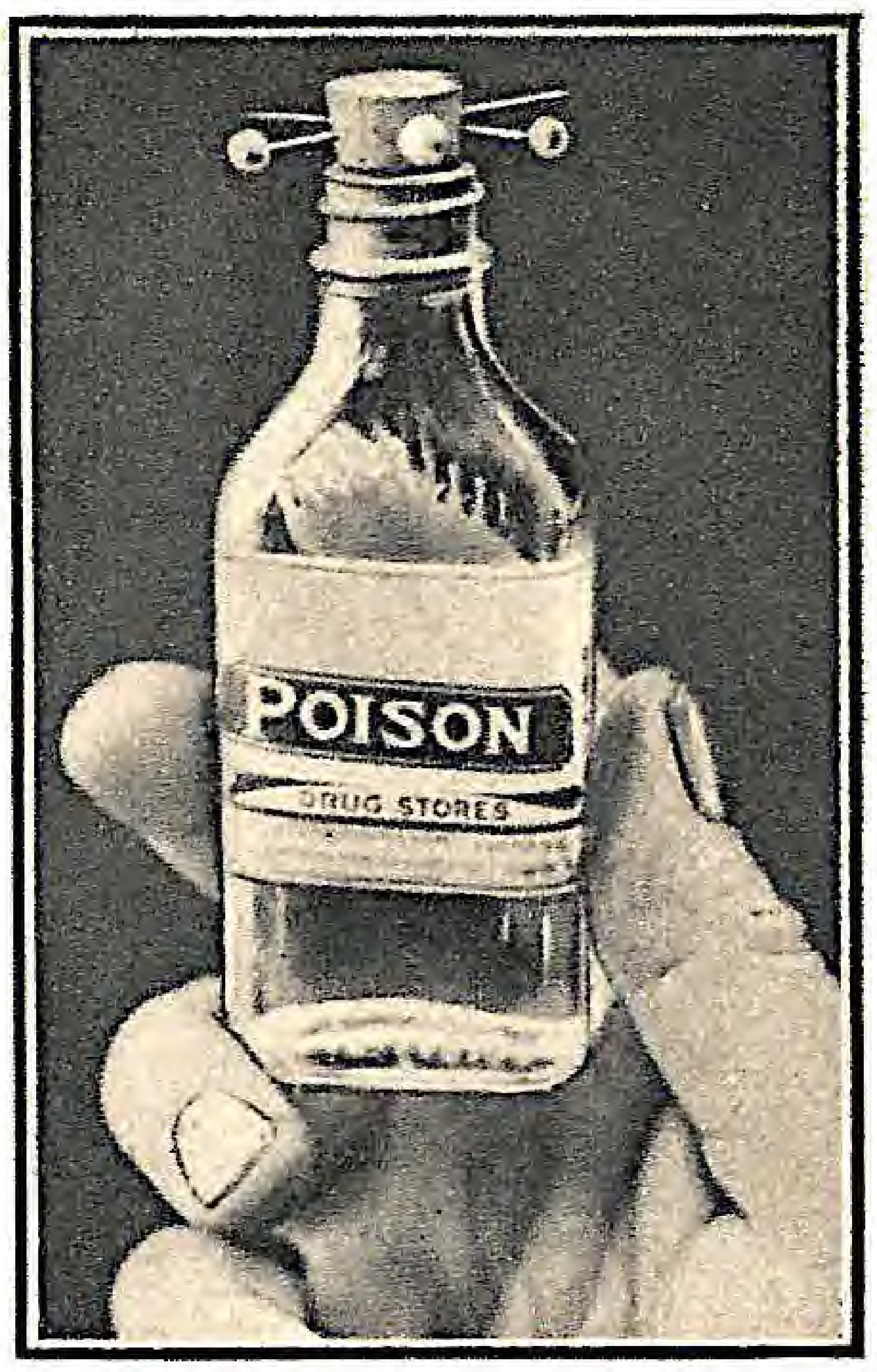


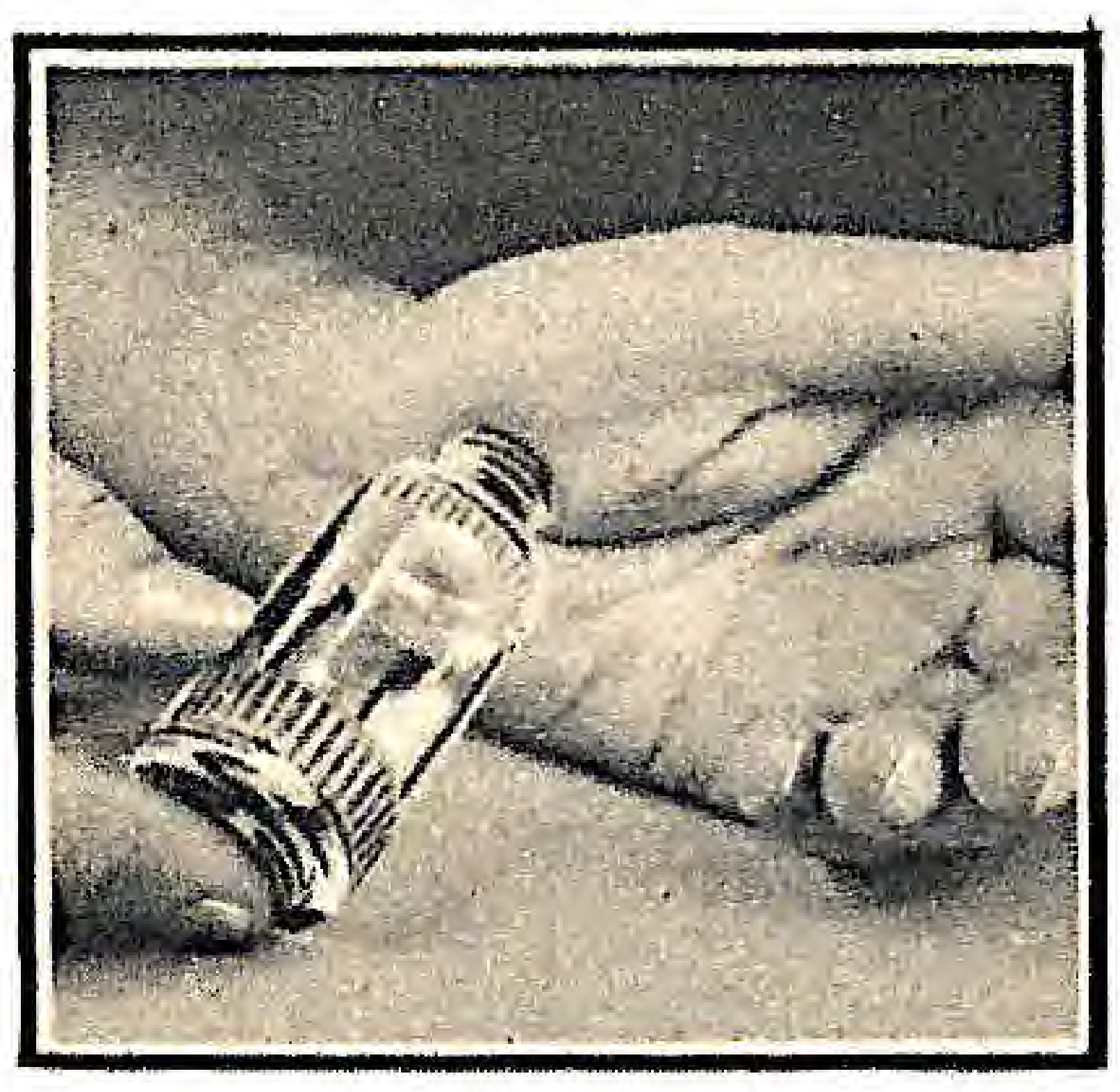
Optical Illusion Shows Brain On Screen

A MYSTICAL and startling optical illusion, an ideal suggestion for party entertainment, consists of focusing attention on a burning candle to see an image of your own brain on a black cloth hung before you. The effect is amazing; the method is simple. Hang a yard of black cloth against the wall with its center on a level with the eyes. Focus the eyes on the upper part of the cloth, at the same time moving a candle back and forth about six inches in front of the nose. After a few moments, a realistic image of the brain will flash onto the black screen. Pass out candles at a party, so all can try the stunt at once.

Pins In Cork Warn Users That Contents Are Poison

POISON mixtures put up in regulation size bottles are always dangerous. Their red labels are not visible in the dark, and anxious parents, rushing to relieve a sick child, are apt to pick up a bottle of deadly poison which has somehow found its way into the customary position on the shelf reserved for the child's medicine. Such mistakes are costly. To avoid them, round headed, steel pins should be driven through corks on poison bottles. The prick of the pins warns the user that he is picking up the wrong bottle.



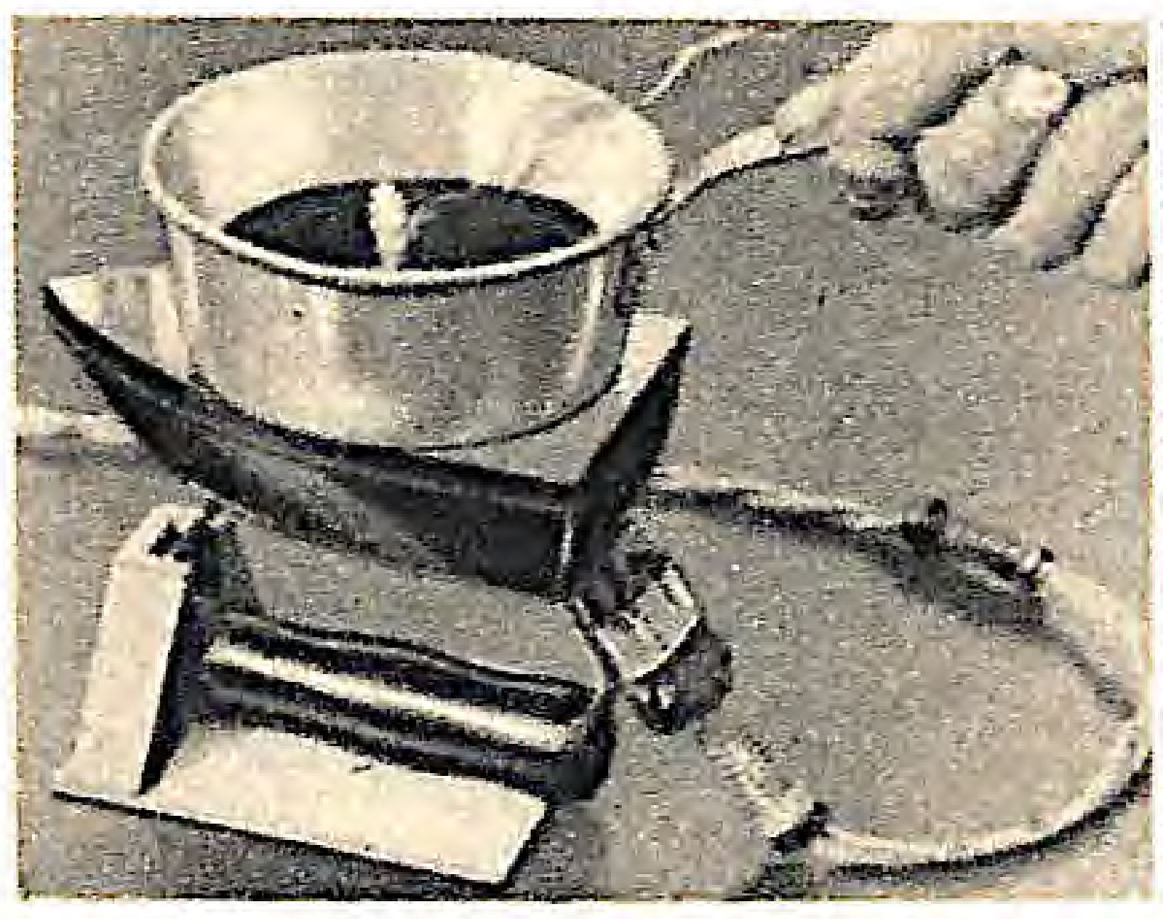


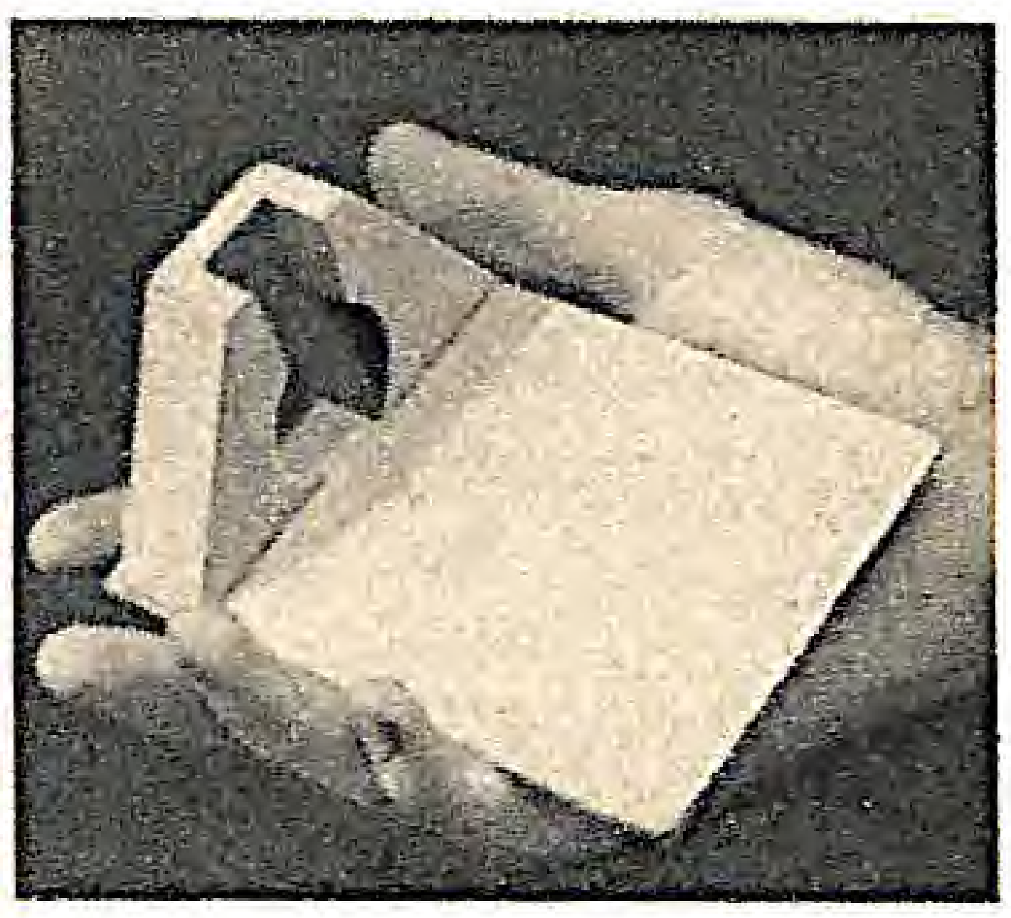
Cooling Of Bottle Creates Vacuum To Draw Slivers

SLIVERS imbedded in the fleshy parts of the body can be quickly removed by a vacuum created in a small bottle. The bottle is first filled with hot water. When the glass becomes uncomfortably hot, the mouth of the bottle is pressed tightly over the wound. After a few seconds, cooling causes the air in the bottle to contract. This vacuum quickly draws out the offending splinter.

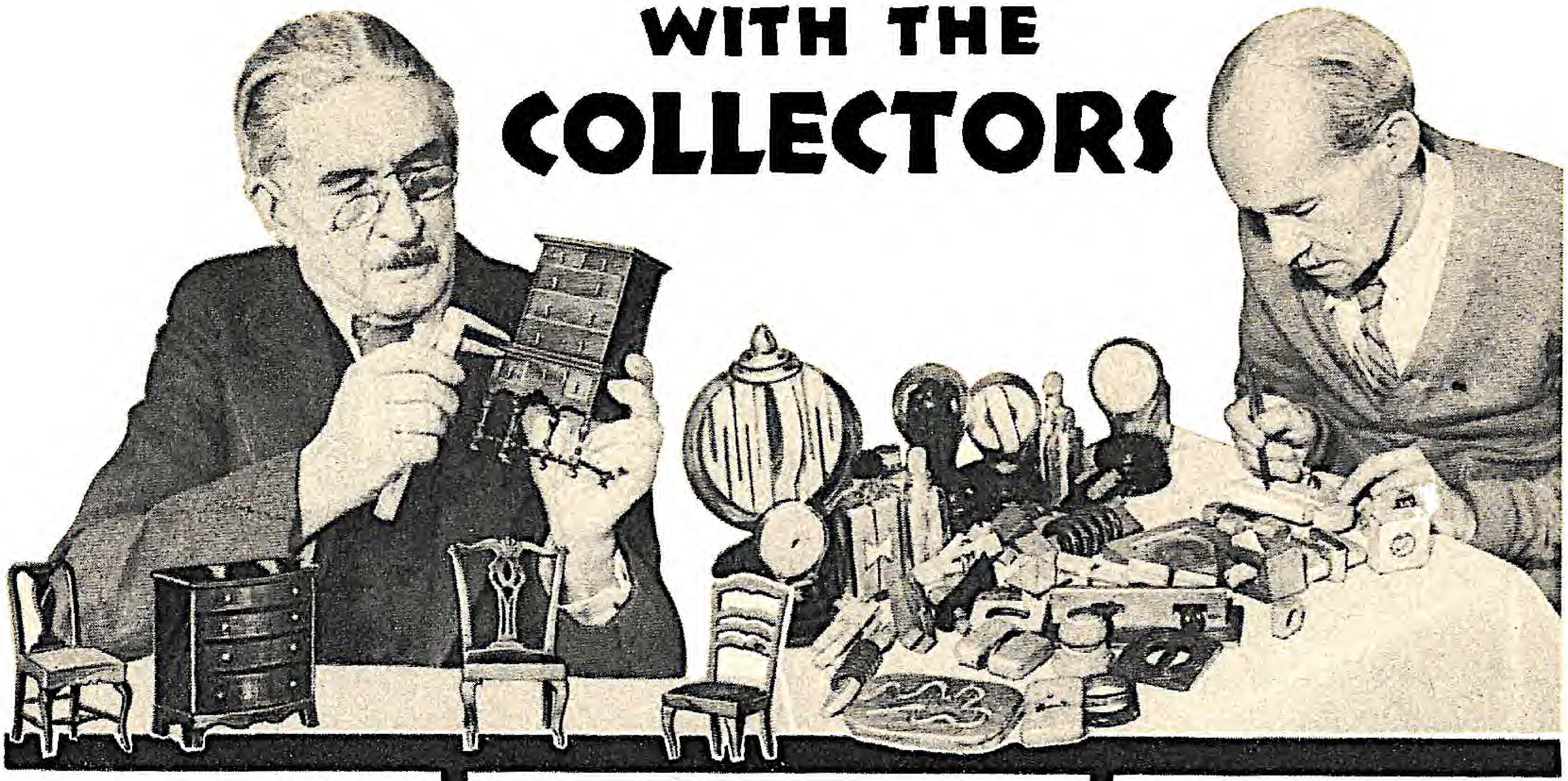
Inverted Iron Serves As Heater

SMALL irons—the type that ladies carry in their bags when traveling—can be quickly converted into stoves for heating water or milk when inverted and held in place by a notched base board. A 3"x3" board is nailed to base. This is notched to hold handle firmly, thus preventing iron from falling.





WITH THE COLLECTORS

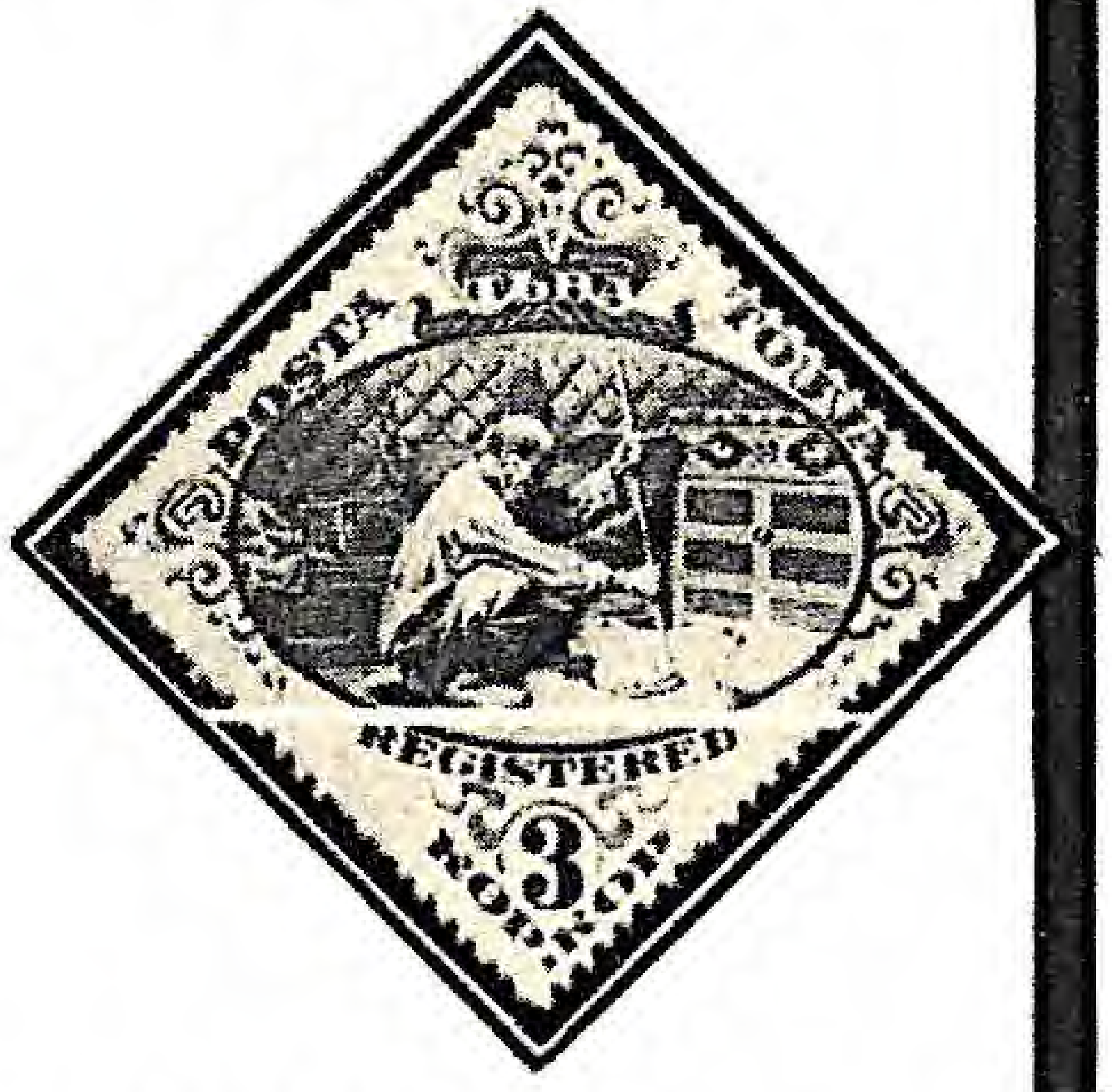


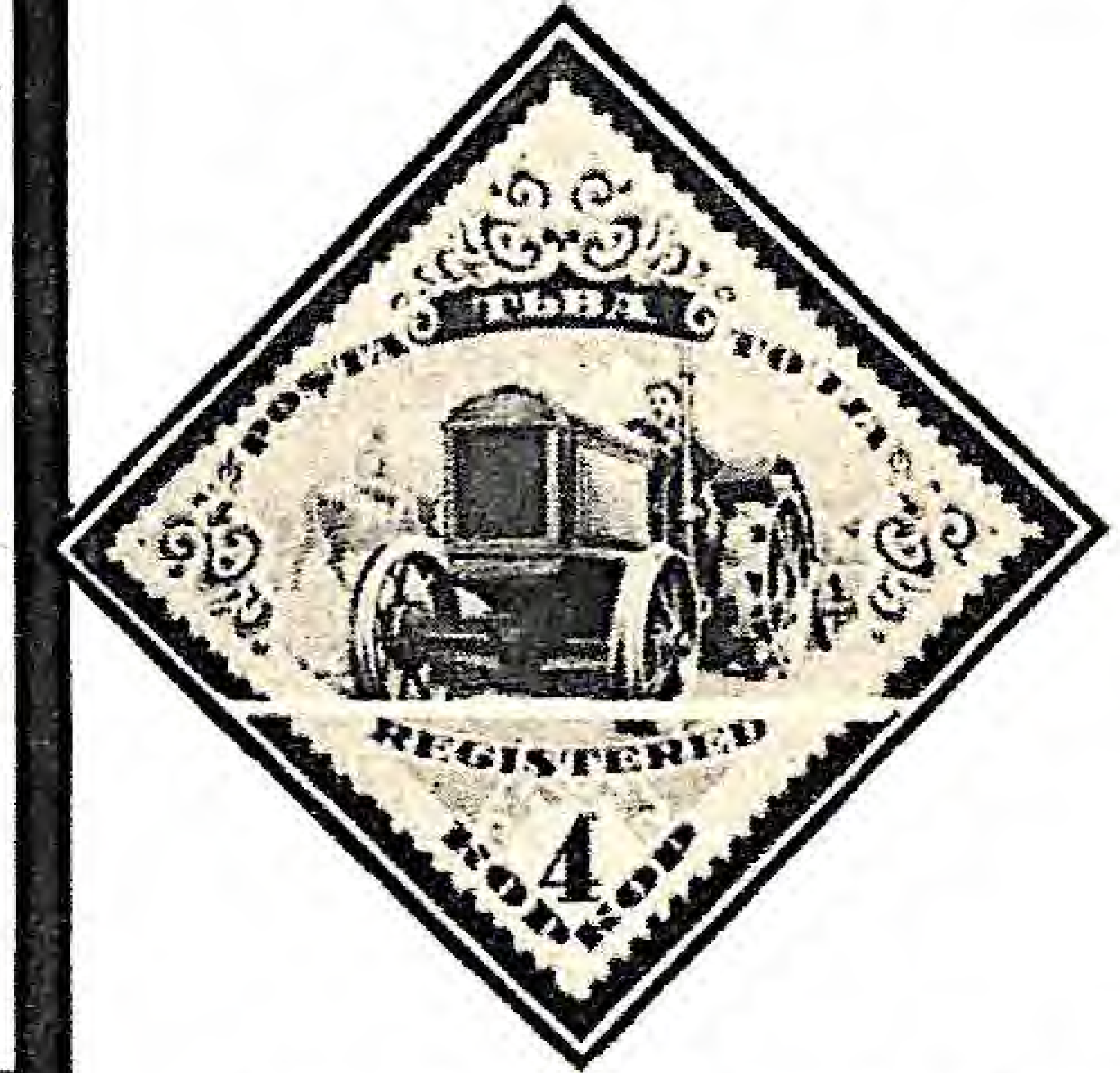
Turning an old hobby into a business, George Cona of San Francisco, makes miniature furniture accurately patterned after Chippendale chairs, Duncan Phyfe tables, Hepplewhite buffets, and other period furniture. He is 78 years old.

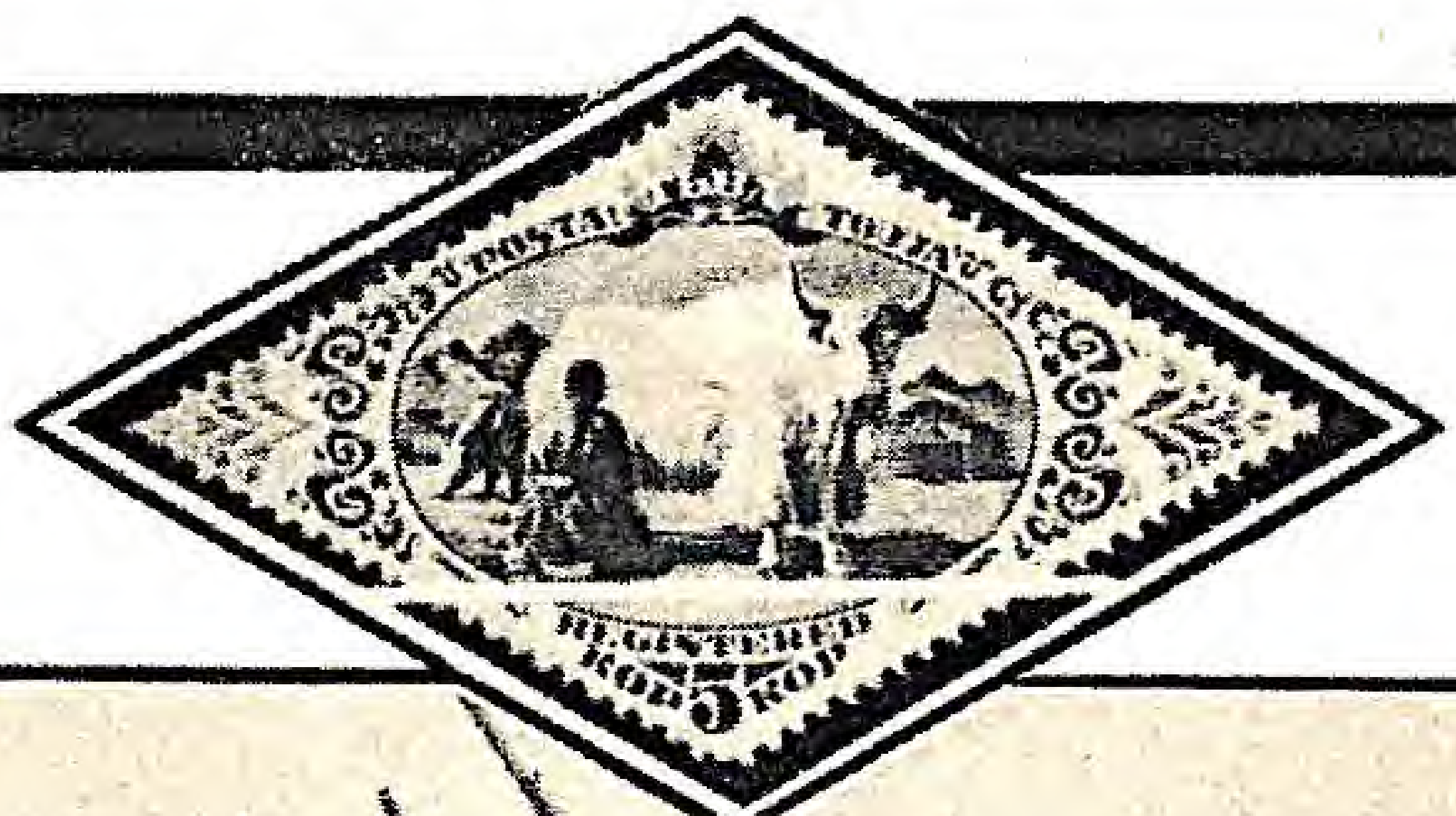
Charles E. Kent, the "puzzle man" is another who has turned his hobby into a livelihood. Deft fingers create intricate puzzles in multitude of designs, all original. Many are mounted in glass spheres —all can be easily taken apart.

WIN $5.00 CASH

CLEAR snapshots and a story not longer than 200 words, covering your own pet hobby or that of a friend, may win for you one of the $5.00 cash prizes offered each month for the most unusual and interesting hobby stories. Send your entry to the Hobby Editor, MODERN MECHANIX AND INVENTIONS, 529 S. 7th St., Minneapolis, Minn. Be sure to include a stamped, addressed envelope if you wish your entry to be returned.

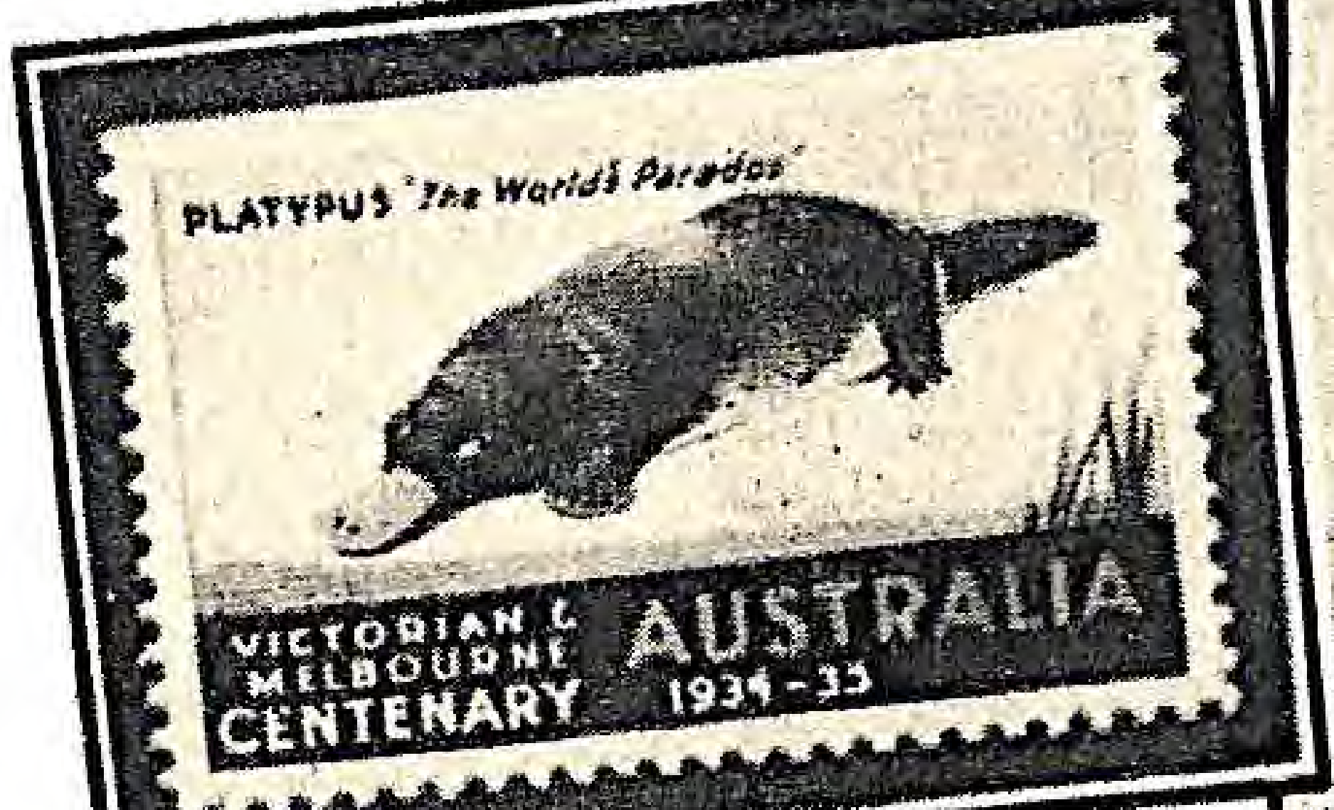




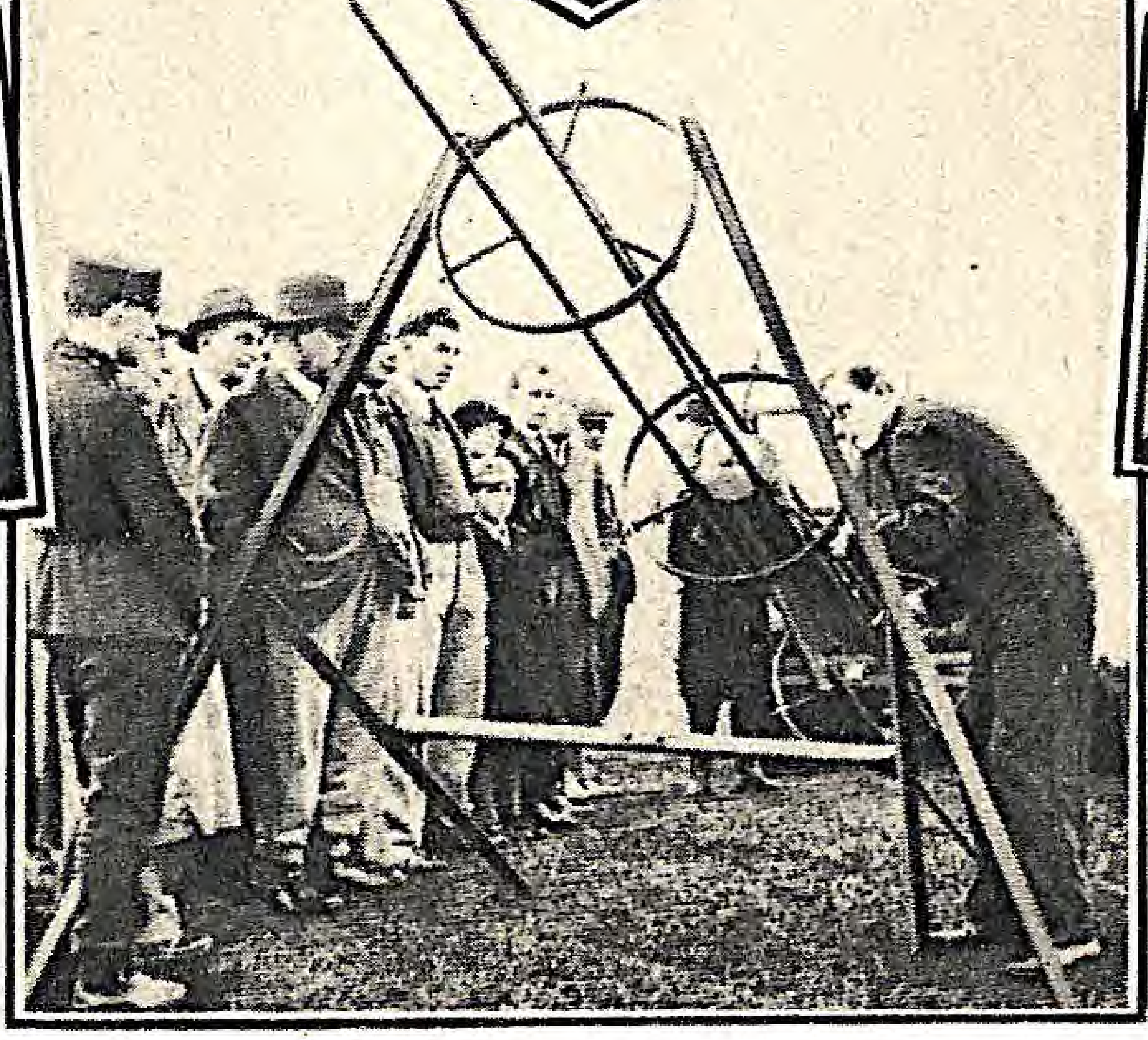


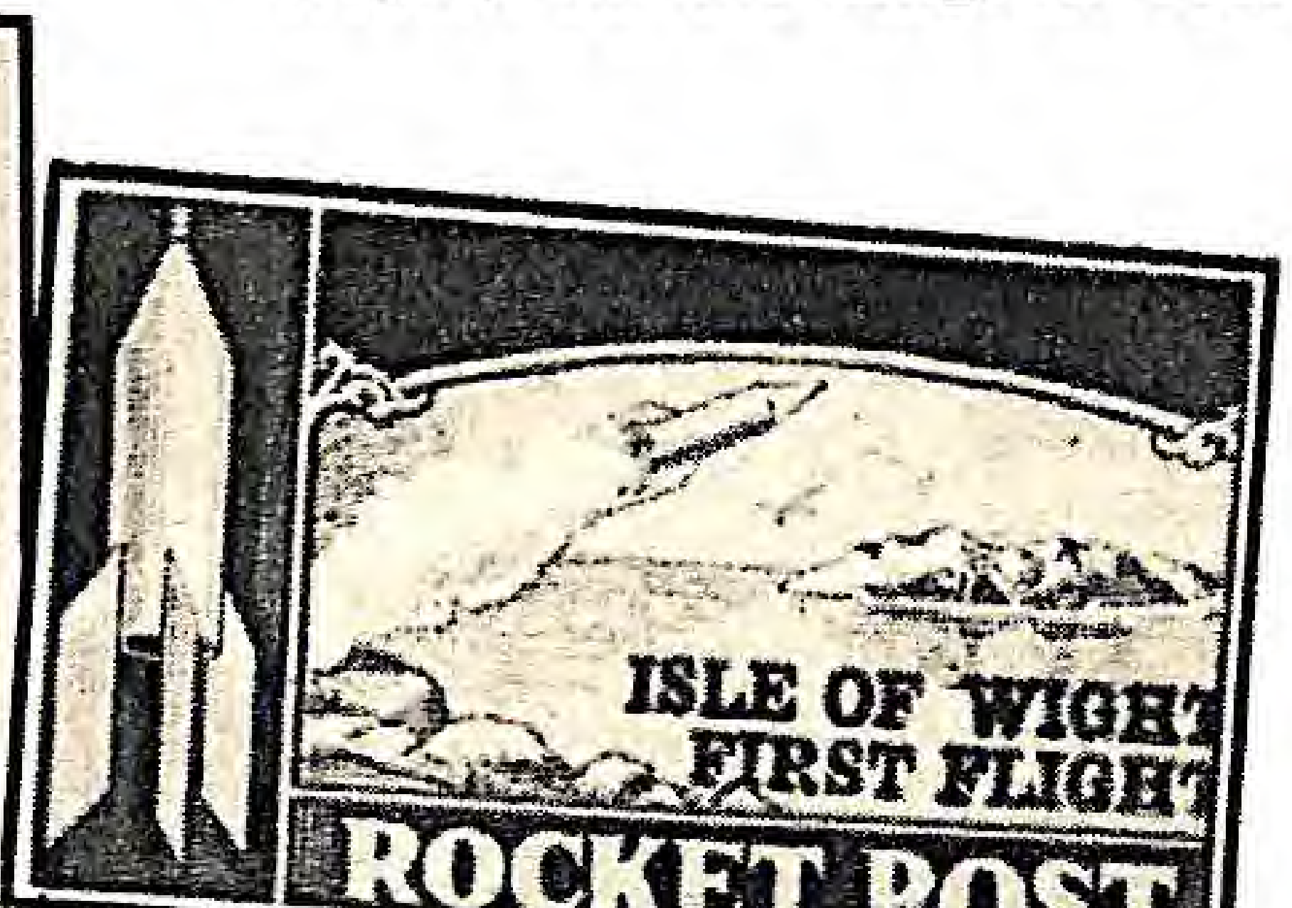
Prized by the beginner as well as the experienced stamp collector are these odd-shaped stamps from Tannu-Tuva, tiny district in northern Mongolia. These registered mail stamps show some peasants at work.

Newest of hobbies is collecting of rocket mail stamps, though not many are available yet. That pictured below was designed to commemorate first delivery of Rocket Mail from Hampshire to Isle of Wight, off the English coast.


PLATYPUS 'The World's Paradox'
VICTORIAN & MELBOURNE CENTENARY 1934-35
AUSTRALIA

Poster stamps, the colorful "miniature billboards" so popular before World War, are again coming into favor as a means of advertising. From Australia comes stamp picturing famous living paradox, the Platypus. National Poster Stamp Society was recently formed in Chicago.





Left: Herr Gerhard Zucker, 26-year-old German inventor, is shown placing mail rocket in launching apparatus at Lymington, Hants, England. Police stopped mail-carrying flight because he had not obtained permission from Home Office to carry out experiment. Another attempt is being planned.

VACATION DREAMS *come true!*

THRILL-PACKED days on the highways — Grand Canyon — Niagara Falls—National Parks—the morning mists of a forest lake, or the silvery brilliance of a desert moon . . . all the things you've hoped for are at the twist of the throttle when you ride a Harley-Davidson. Yes — vacation dreams can come true — at lowest travel cost.

Own a new 1935 Harley-Davidson! It's so easy to pay for — costs so little to run. There's lasting thrill to its speed, stamina, and high-stepping style. See the new Harley-Davidsons at your dealer's store. Let him give you a free ride—ask about his Easy Pay Plan — and send in the coupon.

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Ride a

HARLEY-DAVIDSON

MAIL THIS COUPON

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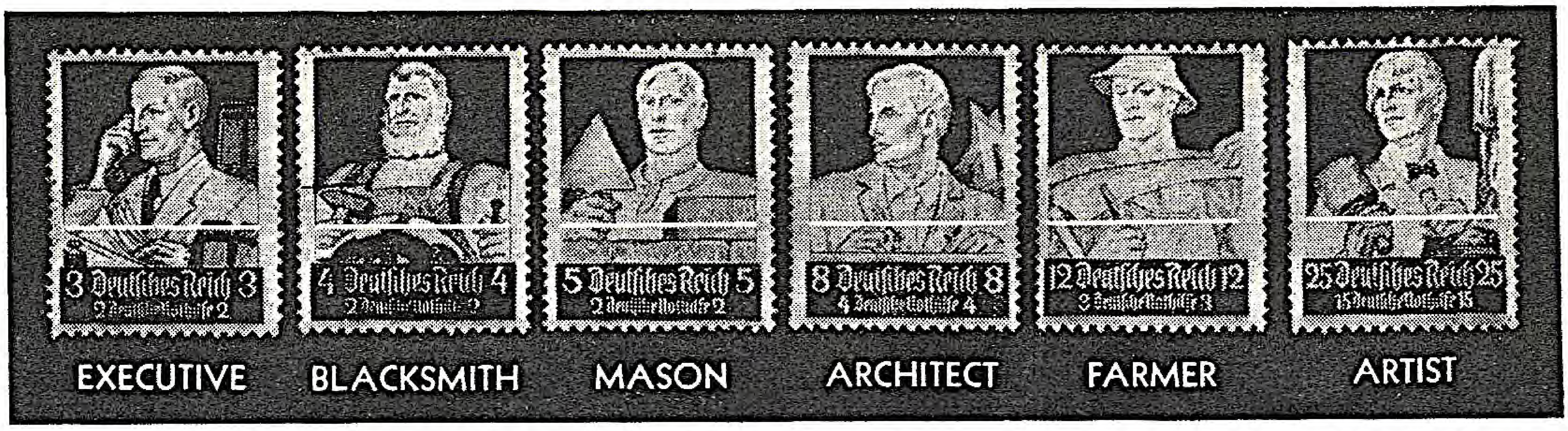
Interested in motorcycling. Send illustrated literature. Postage stamp is enclosed to cover mailing cost.

Name____________________________

Address__________________________

My age is ( ) 16-19 years, ( ) 20-30 years, ( ) 31 years and up, ( ) under 16 years. Check your age group.

"Workers" Charity Stamps Provide Relief Funds for Germany



Pictured above are six of nine stamps in Germany's new charity set. Each stamp has surtax or added charge, indicated by small numerals, which is turned over by government to winter relief organizations. Large numeral is value of stamp for postage. Workers in different occupations are pictured in this unusual set; other three stamps show miner, scientist, and judge at work.

ADLETS FOR HOBBYISTS

STAMPS

SUPER-WONDER packet offered, containing 60 different stamps from Brunei, Transjordania, North Borneo, Zanzibar, Sudan, Macao, Iraq, Jaipur, French and British Colonies, including natives, beasts, ships, etc., all for 5c to approval applicants. Big illustrated lists included. Kent Stamp Company, Box 87 (6), Brooklyn, New York.

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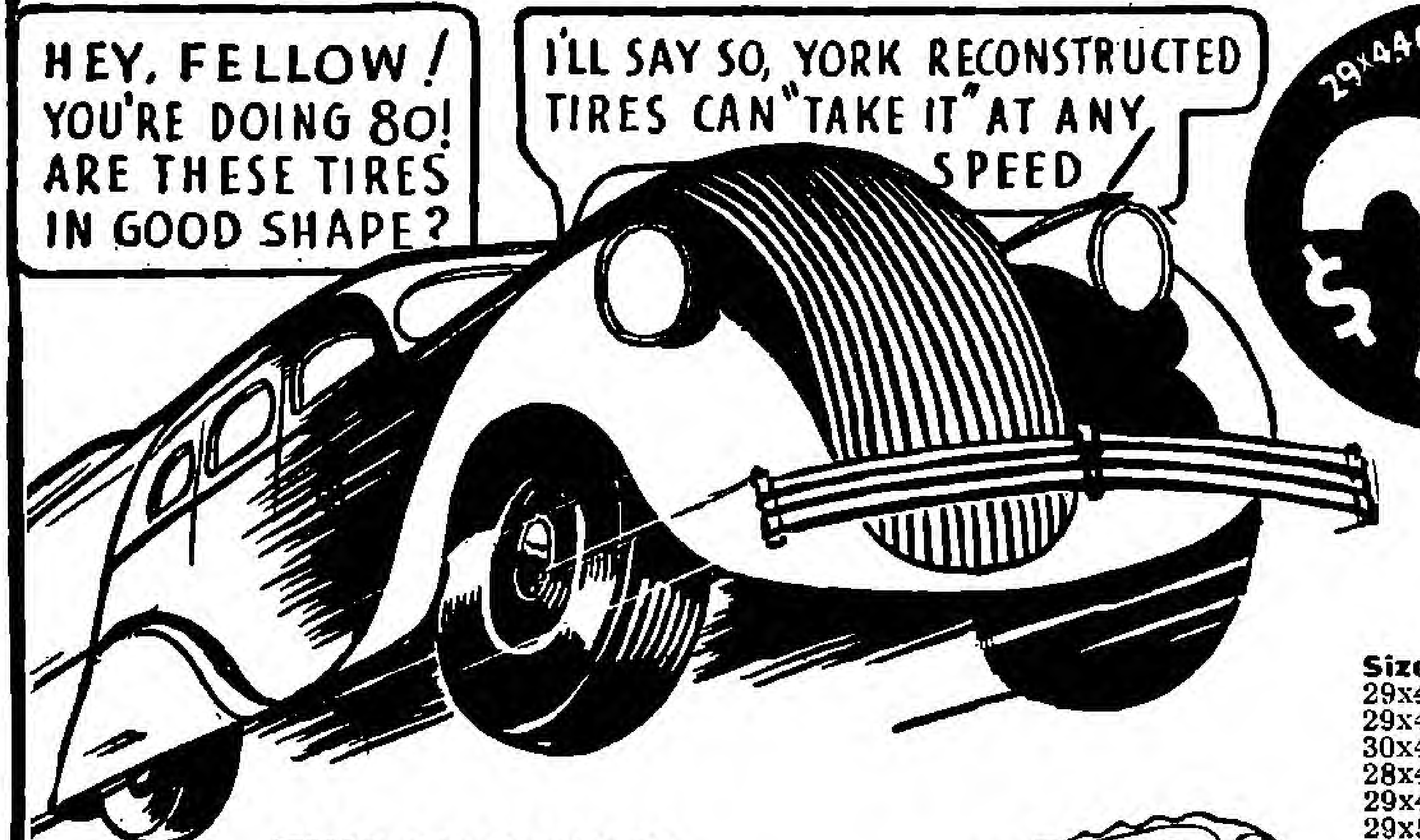
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I'LL SAY SO, YORK RECONSTRUCTED TIRES CAN "TAKE IT" AT ANY SPEED

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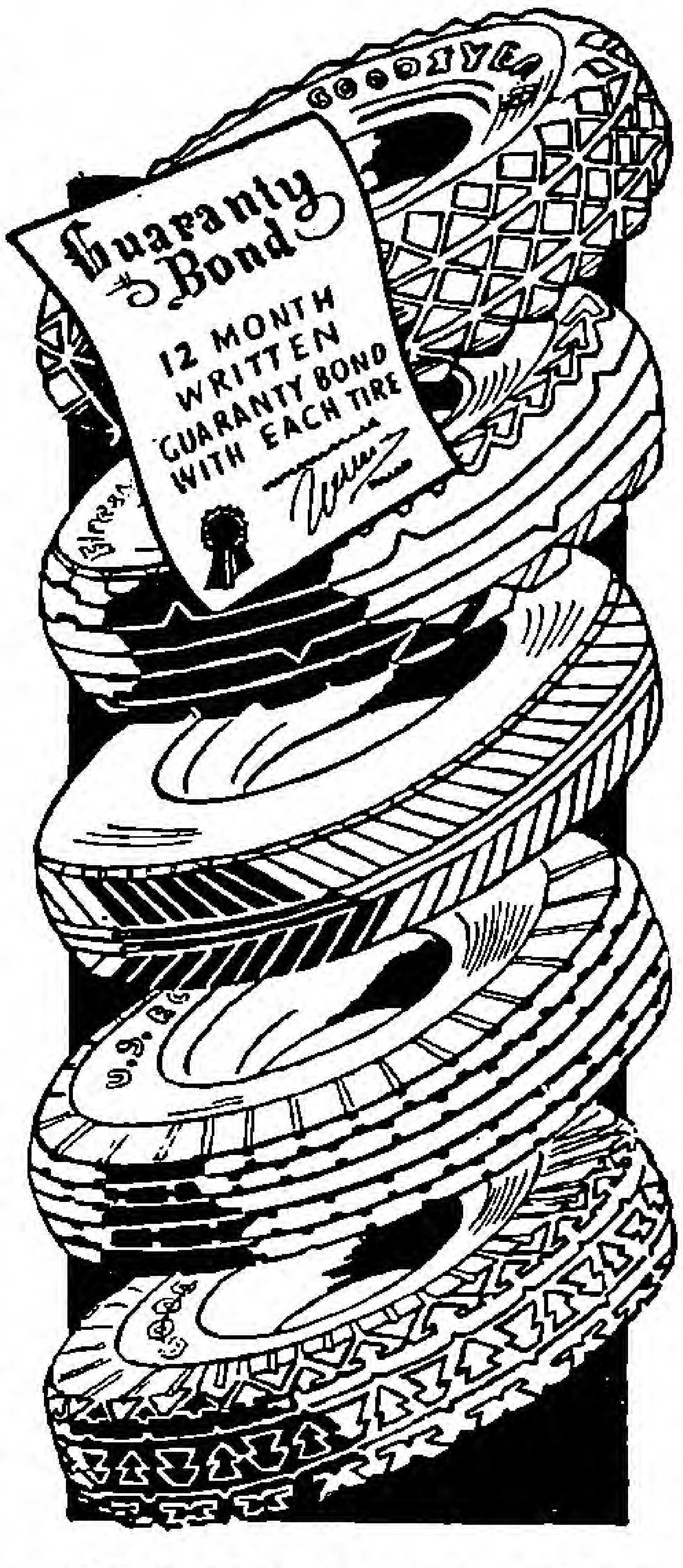
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GOODYEAR
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29x4.50-20	**2.35**	0.85	31x5.25-21	**3.25**	1.15
30x4.50-21	**2.40**	0.85	28x5.50-18	**3.35**	1.15
28x4.75-19	**2.45**	0.95	29x5.50-19	**3.35**	1.15
29x4.75-20	**2.50**	0.95	30x6.00-18	**3.40**	1.15
29x5.00-19	**2.85**	1.05	31x6.00-19	**3.40**	1.15
30x5.00-20	**2.85**	1.05	32x6.00-20	**3.45**	1.25
28x5.25-18	**2.90**	1.15	33x6.00-21	**3.65**	1.25
29x5.25-19	**2.95**	1.15	32x6.50-20	**3.75**	1.35

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30x3½	**2.35**	0.75	33x4½	**3.45**	1.15
31x4	**2.95**	0.85	34x4½	**3.45**	1.15
32x4	**2.95**	0.85	30x5	**3.65**	1.35
33x4	**2.95**	0.85	33x5	**3.75**	1.45
34x4	**3.25**	0.85	35x5	**3.95**	1.55

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Size	Tires	Tubes
30x5 Truck	**$4.25**	$1.95
34x5 Truck	**4.25**	2.00
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34x7 Truck	**10.95**	3.95
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Size	Tires	Tubes
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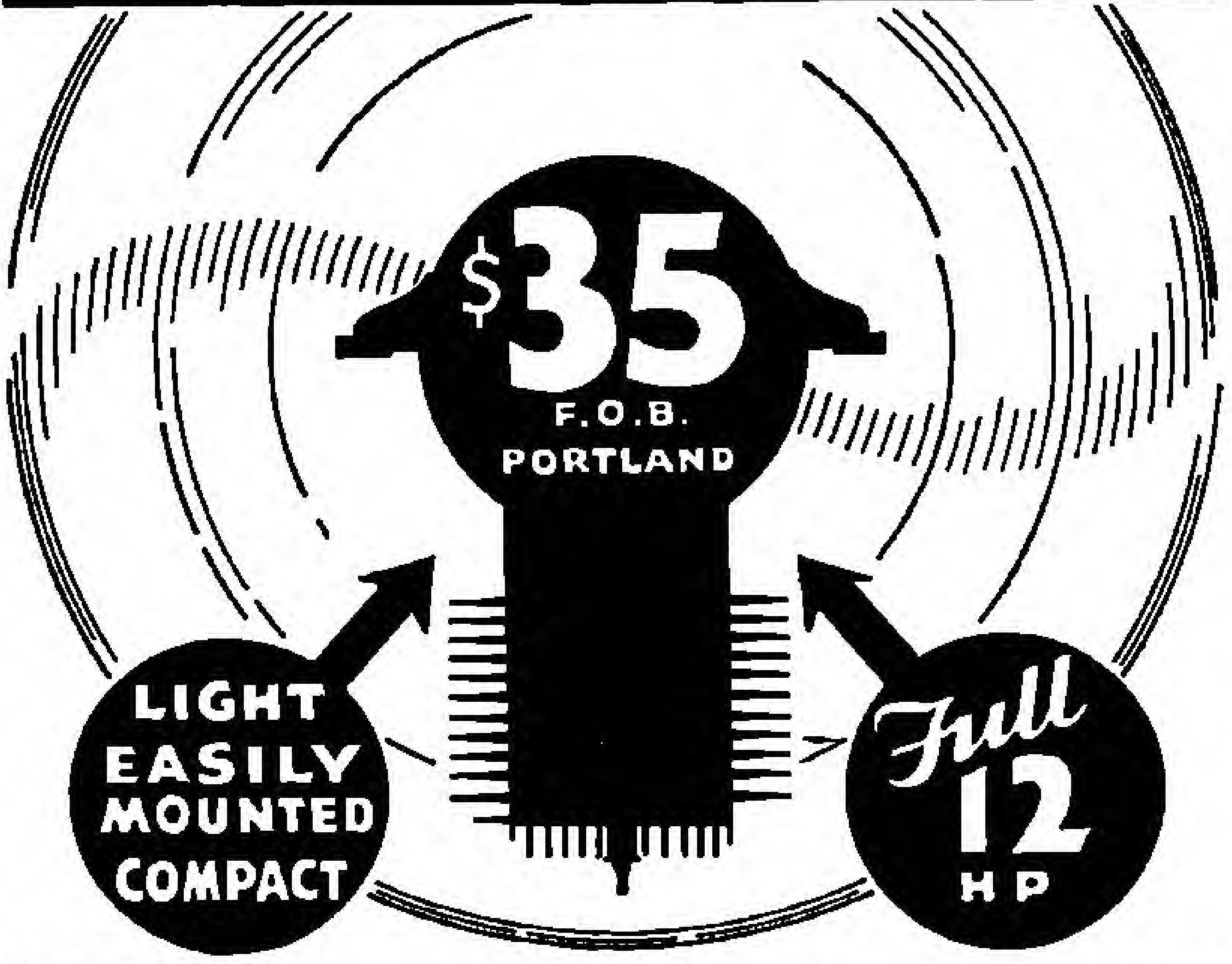

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Now you can build that air-driven vehicle you have always wanted—without doubts and worries about your power plant. Columbia Motor Builders offer this fine power plant, MODERN AS 1935 AIRCRAFT ENGINES, Complete with all essential equipment and propellor at only $35.00!

The "AeroMotor" is a snappy, reliable, two-cycle, single cylinder air-cooled smooth running motor, delivering a full, pulsing 12 h.p. . . . to carry you where you wish to go, and give you the thrills of air-driven travel over land or water—even in the air!

THRILLING SPORT

Many persons have thrilled to the sport of air-driven travel, on ice and snow in winter; over water or land in summer; but the crude and unsatisfactory converted motorcycle and automobile engines have offered the only available low-priced power plants, preventing thousands from enjoying this sport.

With the amazingly simple, reliable and low-priced Columbia AeroMotor you need worry no longer about your power plant. We have taken care of that, and at a lower price than you would be asked to pay for the conversion cost alone on a motorcycle or auto engine!

AeroMotor is Built for the Purpose

Write today for full details about AeroMotor. There is no obligation. . . . Or send your order direct . . . or make a deposit on your AeroMotor to assure early delivery. Should you decide not to purchase after examining our literature, your deposit will be immediately and cheerfully refunded.

USE THIS COUPON NOW
Get Your Share of Summer THRILLS
(Please enclose stamp)

COLUMBIA MOTOR BUILDERS
Dept. 2-B Security Building Portland, Oregon

☐ I am enclosing stamp. Send without obligation to me, full details of the new $35.00 AeroMotor.
☐ I am enclosing $10.00 deposit. Please place my name on your delivery schedule, holding my AeroMotor for early delivery, sending me at once full details; if I decide not to purchase I understand you will refund my money.
☐ I am enclosing $35.00. Rush my AeroMotor as fast as possible, along with FREE plans on building air-driven boats, sleds, gliders, etc.

NAME ....

ADDRESS ....

TOWN ....STATE ....

Meet The Dispatcher

[*Continued from page* 69]

before his rattling telegraph, shooting orders East and West to both ends of the line. The passenger trains are running on time. Extra 492, with no time card, or established rights, must make all its meetings from direct orders. He issues such orders and sits back for a rest.

And something goes wrong. An engine is failing for steam; a box is running hot on a manifest train scheduled to run a train of perishable fruit through on record time with rights over all but passenger trains; a track walker has found a broken rail; the valve of a water tank is sticking—and due to these delays he must reconstruct his work all over again, change his meeting points, let fast trains by slower schedules—snapping out his orders in a frenzy of haste but ever mindful of that one vital item SAFETY!

Bad Weather May Disrupt System

Something is always happening on a district of the ordinary railroad. Something is always taking place to demand his best efforts. Weather conditions make him tear his hair. He has allowed a tonnage train, a long freight with a capacity load for the size of its engine, to leave a terminal. The wind was but a breeze at the time but an hour later it has suddenly risen to a gale. The engine is forced to double a hill because of the wind pressure against the long string of cars making it impossible to handle so much resistance. The train-crew was forced to uncouple the train and take it up the hill in two sections. Westbound passenger 517 was held up 10 minutes as a result. More trouble. He will get a sarcastic letter from the trainmaster about that. Poor judgment in overloading an engine under existing conditions—

Traffic Must Be Kept Moving

"How's nine?" some one down the line inquires. "How many tons shall we give the WP-8?" a yard master asks. "Who's going to pick up our car of stock?" an agent wants to know. "How's everything coming?" the trainmaster asks from the other end of the district as he checks up and keeps track of things in general. The dispatcher answers one and all of these questions in a flash.

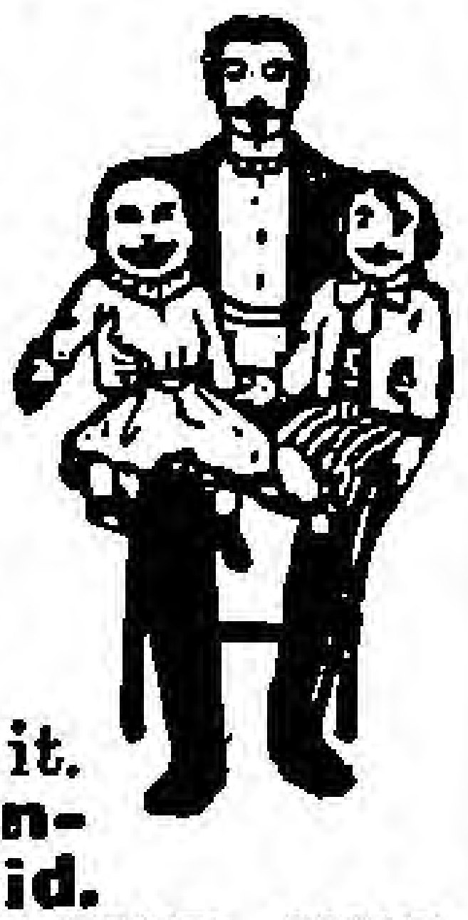
"Extra east has a car derailed at the head-in switch—" comes to him over the wires. This complicates matters. The road is sewed up tight as a drum until that car can be re-railed and the main line cleared. He orders the "big-hook" otherwise known as the wrecker.

He slams out orders rapidly. That one mishap has made an entirely different railroad out of the one of a few moments ago. He puts trains on the sidings so the wrecker will

[*Continued on page* 144]

BOYS! THROW YOUR VOICE

Into a trunk, under the bed or anywhere. Lots of fun fooling teacher, policeman or friends.



THE VENTRILO

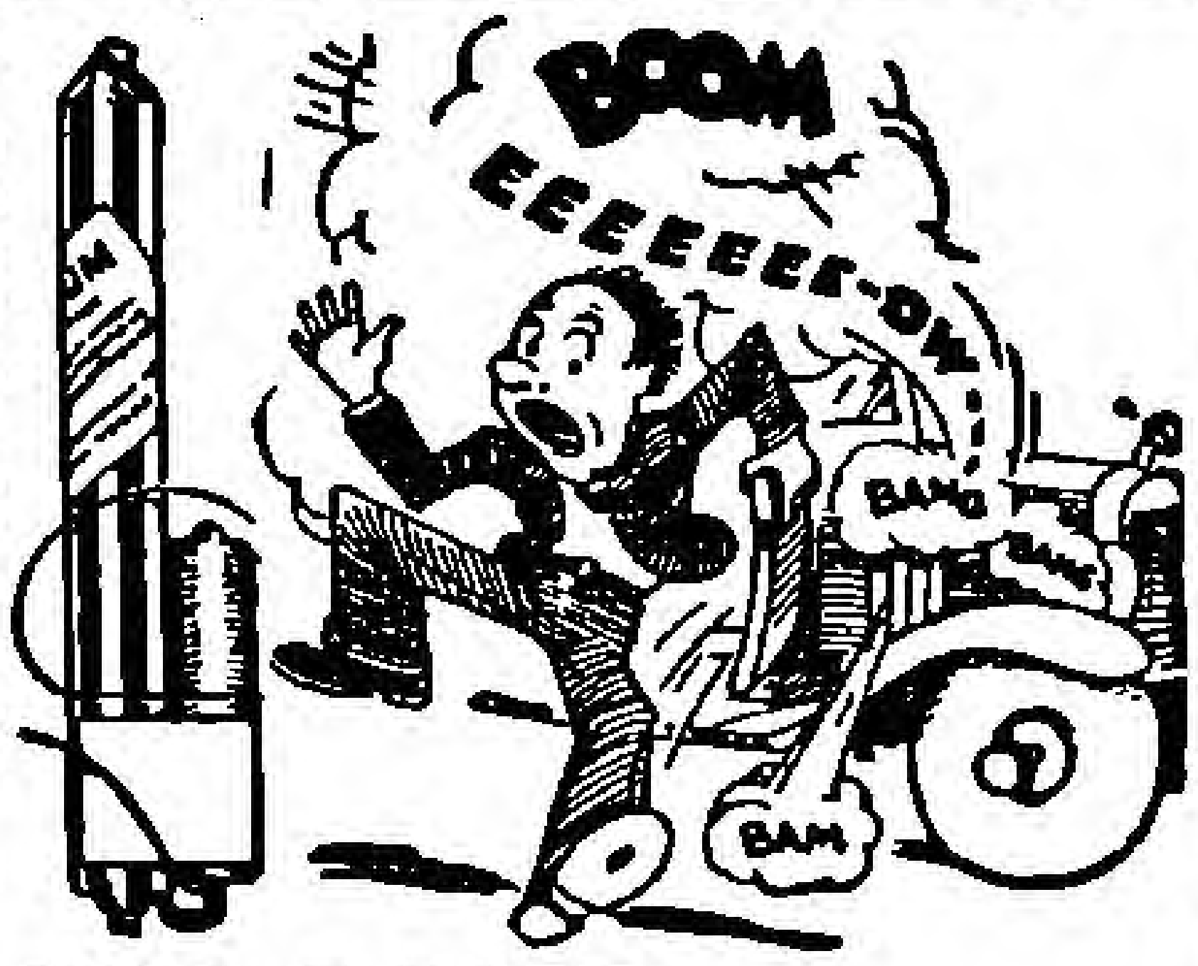
a little instrument, fits in the mouth out of sight, used with above for Bird Calls etc. Anyone can use it. **Never fails. A 64-page Book on Ventriloquism and the Ventrilo. All for 10c Postpaid.**

JOHNSON SMITH & CO. Dept. 619, RACINE, WIS.

AUTO SCARE BOMB

The Auto Bomb is attached to the motor of your car, fastening one wire to the spark plug terminal and the other wire to any part of the motor to serve as a ground. The instant your "victim" steps on the starter, there is a shrill whistle, followed by a loud bang. The driver thinks his car has exploded. Can be attached in a few seconds. Does not harm the car. Gives you more protection than an insurance policy—catches the thief in the act.

PRICE 15c Each, 3 for 40c.
Shipped by Express, not prepaid.

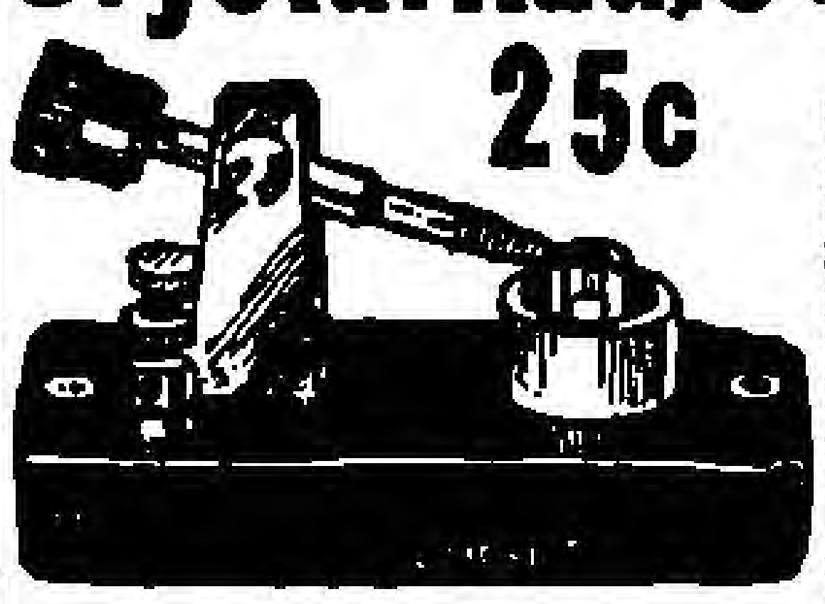


AUTO SKUNK BOMB

Works same as above. Attached to motor of car. When driver presses foot on starter the contact sets off the Skunk Bomb. A dense cloud of smoke envelops front of car; upon raising hood a violent odor greets the driver. **PRICE 20c Each, 3 for 50c.** *Shipped Express only.*

Crystal Radio

Complete with Crystal 25c



25c

This Detector is practically a radio in itself, as it is possible to get reception with it alone, provided you are within 25 miles of a broadcasting station (or up to 100 miles under very favorable conditions). All you need is an aerial and an ear phone and you are all set. It is completely assembled and wired, all ready for use. It has two posts, making connection much easier, also making it possible to make changes quickly. Everything complete, including the stand, crystal cup, arm with catswhisker and necessary screws, an ultra sensitive crystal of the finest grade, two terminals for wire connections mounted on handsome base—**EVERYTHING COMPLETE FOR ONLY 25 CENTS POSTPAID.** Every set tested and reception positively guaranteed.

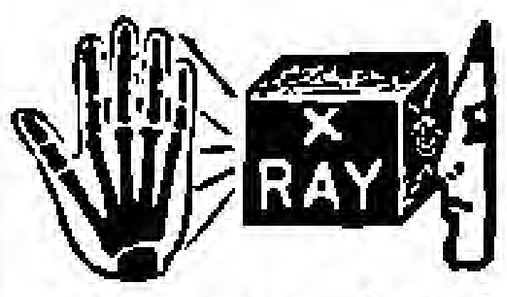
Put PHOTOS on Silk, Cloth, Wood, Paper, Linen, etc. 25c

THIS EASY QUICK WAY

It is now easy to print your snapshots and other photos on any cloth or other fabric surface—cushions, pillows, handkerchiefs, scarfs, ties, hosiery, underwear, paper, wood, linen, etc. The photos are washable. Will not fade or rub off—long lasting. Easy to do. Just follow a few simple directions. One bottle is good for about 50 prints in RICH TONES. Thoroughly practical.

Price for Complete Outfit, only 25 cents postpaid.

WONDERFUL X-RAY TUBE



A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. Price **10c, 3 for 25c, ppd.**

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250 Magic Tricks
An excellent little book containing nearly 300 tricks for parlor or stage that anyone can do. Tricks with cards, coins, handkerchiefs, eggs, bottles, string, etc. Also Second Sight, Shadowgraphy, etc. Profusely illustrated. **10c postpaid.**

125 CARD TRICKS and sleight of hand. Contains all the latest and best card tricks as performed by celebrated magicians, with exposure of card tricks used by professional gamblers. **Price 25c postpaid.**

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Greatest boys' book written. Tells how to make a Pinhole Camera, a Canoe, model Railroad, a Telephone, Boomerang, Telegraph Instrument, Box Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Paddle Raft, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages. 150 illustrations. **PRICE 10c.**

MIDGET BIBLE. Size of a postage stamp. Over 200 pages. Remarkable curiosity. Said to bring good luck. **Price 15c postpaid.**

DREAM BOOK AND FORTUNE TELLER. Tell your own fortune. With dictionary of dreams and interpretations, lucky numbers, oracles, divinations, palmistry, etc. **10c.**

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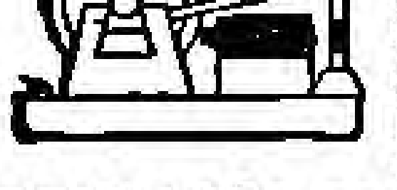
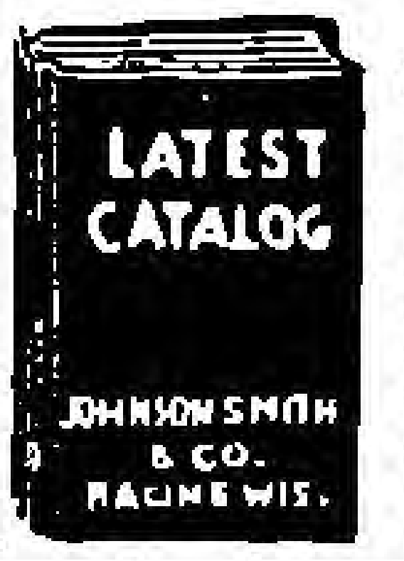
5-MINUTE HARMONICA COURSE. A new easy self-teaching method. Teaches how to play, to use the tongue, tremolo, fully illustrated. **Price 15c postpaid.**

BOY ELECTRICIAN



Book tells all about electricity in simple language. How to make batteries, dynamos, motors, telephones, bells, coils, engines, lights, telegraph apparatus, alarms, radios, etc. 64 pages. Fully illustrated.
PRICE 10c postpaid.


LATEST CATALOG
JOHNSON SMITH & CO.
RACINE WIS.

JOHNSON SMITH & CO.

Dept. 619, RACINE, WIS.

A copy of our NEW CATALOG mailed on receipt of 10c., or the De Luxe Edition with cloth binding 25c. Bigger and better than ever. Only book of its kind in existence. Contains all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unprocurable elsewhere. Remit by Coin, Money Order, Check or unused U. S. Postage Stamps, for all articles listed above. Canadian money, stamps, Postal Notes and British P. O. Orders accepted.

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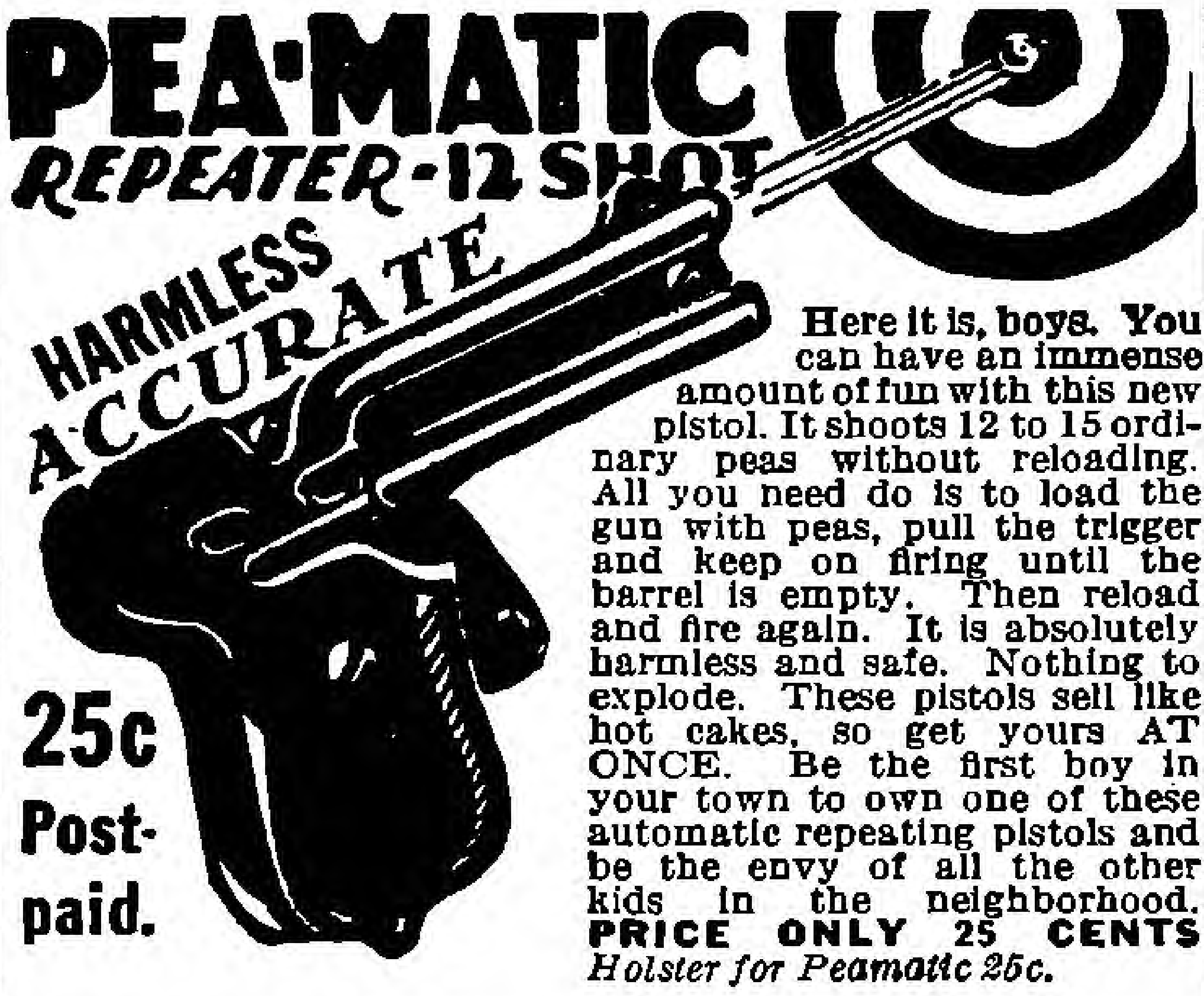


25c Post-paid.

Here it is, boys. You can have an immense amount of fun with this new pistol. It shoots 12 to 15 ordinary peas without reloading. All you need do is to load the gun with peas, pull the trigger and keep on firing until the barrel is empty. Then reload and fire again. It is absolutely harmless and safe. Nothing to explode. These pistols sell like hot cakes, so get yours AT ONCE. Be the first boy in your town to own one of these automatic repeating pistols and be the envy of all the other kids in the neighborhood. **PRICE ONLY 25 CENTS**
Holster for Peamatic 25c.

The Art of

DANCING

25 CENTS Postpaid

LEARN TO DANCE THE LATEST STEPS. Be popular this season. Really good dancers are always admired—always popular guests. Partners welcome them eagerly. With the aid of this book you can learn the newest, smartest steps without a teacher and become a dancer who is sought after. After following the instructions in this new book you won't need to make excuses when the dance music starts. Besides you'll get lots more fun out of parties and dances. If you want to become a perfect dancer, learn to dance at home this new, easy way.

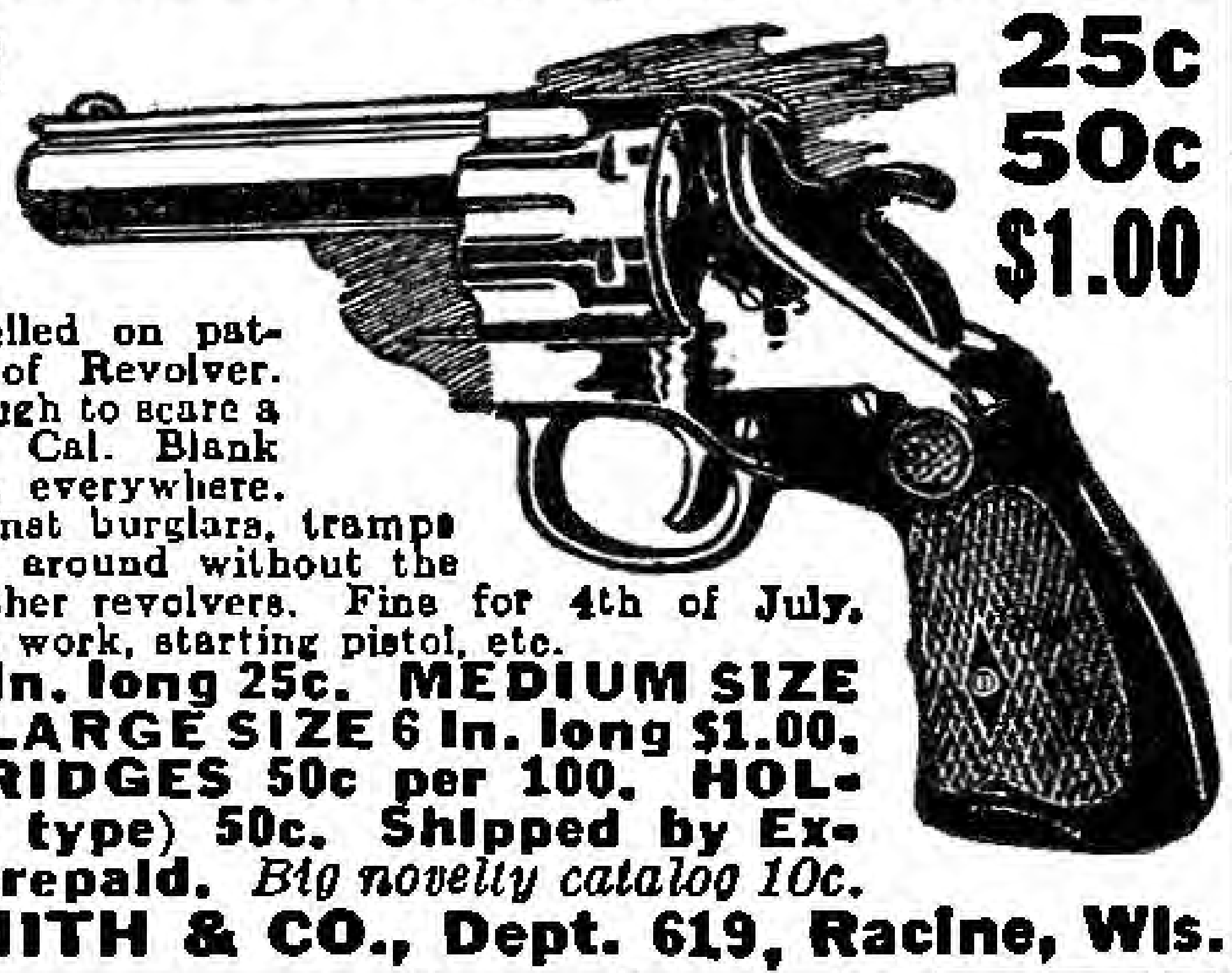
WHAT THE BOOK TELLS: How to develop poise and control, how to improve your dance steps, the art of holding, how to walk to music, how to lead, how to do the latest Fox Trot Steps, Natural and Reverse Turns, the Reverse Wave and Change of Direction Steps, the Quickstep, swaying to music, how to Waltz, Backward Changes, how to do the Continental, the famous Kiss dance, the Manhattan Dance, the College Rhumba, the Carlo, etc., etc. Numerous illustrations are given, in fact everything is made so plain and simple that if you follow the instructions given, you'll be dancing before you know it.

PRICE 25 CENTS POSTPAID.

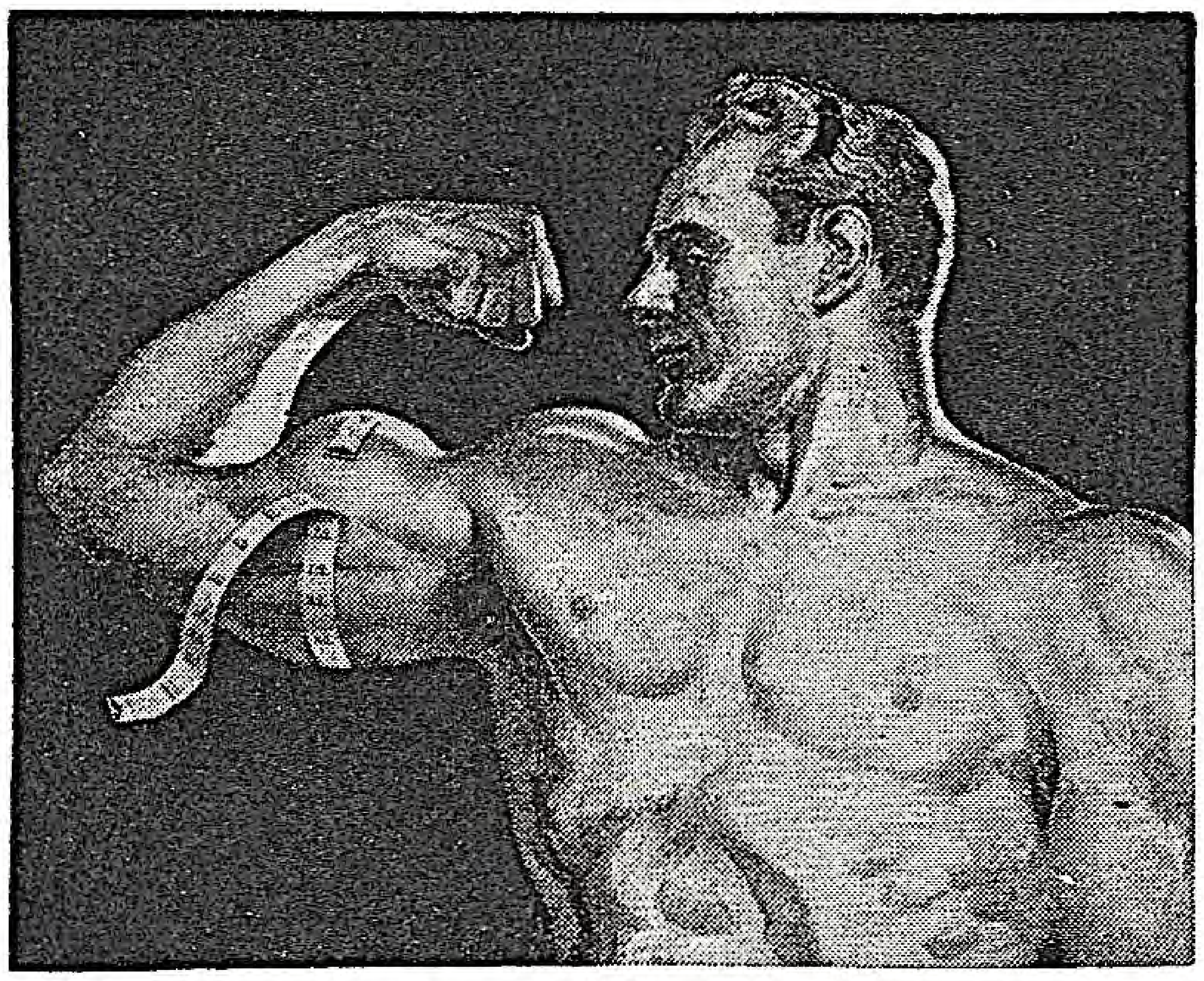
BLANK CARTRIDGE PISTOL

REVOLVER STYLE

25c 50c $1.00



Three new models now out, **25c, 50c and $1.00.** Well made and effective. Modelled on pattern of latest type of Revolver. Appearance alone enough to scare a burglar. Takes 22 Cal. Blank Cartridges obtainable everywhere. Great protection against burglars, tramps dogs. Have it lying around without the danger attached to other revolvers. Fine for 4th of July, New Year's, for stage work, starting pistol, etc. **SMALL SIZE 4 in. long 25c. MEDIUM SIZE 5 in. long 50c. LARGE SIZE 6 in. long $1.00. BLANK CARTRIDGES 50c per 100. HOLSTER (Cowboy type) 50c. Shipped by Express only not prepaid.** *Big novelty catalog 10c.*
JOHNSON SMITH & CO., Dept. 619, Racine, Wis.



»If you do not add... 2 INCHES TO YOUR BICEPS

THREE INCHES TO YOUR CHEST

... it won't cost you one cent!"

Signed: GEORGE F. JOWETT

TWO solid inches of tough, sinuous muscle added to your biceps . . . three inches to your chest . . . or it won't cost you one penny! That's my unqualified agreement!

You will not only increase your biceps, but every part of your body will be developed proportionately . . . I'll show you how to add at least 3 inches to your chest . . . I'll show you how to get lithe, muscular legs that will be columns of power for speed and endurance . . . your whole body will vibrate with muscular energy, pep and health! Wouldn't you like a he-man's bicep like the idealized figure above?

Take my full course, if it does not do all I say . . . if you are not completely satisfied . . . and *you* are the judge . . . it won't cost you one penny!

Send for "Moulding a Mighty Arm" A Special Course for ONLY 25c

It will be a revelation to you. You can't make a mistake. The assurance of the strongest armed man in the world stands behind this course. I give you my secrets of development illustrated and explained as you like them. Mail your order now while you can still get this course for only 25c.

I will not limit you to the arm or chest . . . Try any one of my test courses listed below at 25c. Or, try all six of them for only $1.00.

Mail your order now and I will include a FREE COPY of **"NERVES OF STEEL, MUSCLES LIKE IRON."** It is a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the Jowett Way! Reach out—Grasp this special offer!

FREE BOOK WITH PHOTOS OF FAMOUS STRONG MEN

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"Champion of Champions"

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- ☐ Strong Man Stunts Made Easy, 25c
- ☐ **All 6 Books for $1.00.**

Name ....Age ....

Address ....

Completing Midget Miller

[*Continued from page* 112]

1/8″ strap iron and welded or bolted to the shift lever shaft. A pipe, held firmly to the sliding plate with strap clamps, passes through the other end of the connecting rod. This end turns freely so that when the shift lever is pushed forward the sliding plate and motor move forward. If you wish to have a firmer mounting for the motor use two connecting rods, one at each end of the sliding plate and held by one pipe across the plate.

How the Shift Works

On the countershaft is an inverted V pulley 3″ in outside diameter. When the plate is moved back by the shift lever, this pulley engages the V of the big double V pulley on the axle. The inverted V pulley is of hardwood. This loosens the forward drive belt, and causes the car to move in reverse. When the shift lever is down, the motor is pulled forward, together with its integral countershaft, and the V reverse pulleys are pulled apart and the forward drive belt tightens up, thus giving forward motion. When held in neutral position, the V friction pulley is not in reverse position, nor is the forward belt tight. Thus the motor can run when the shaft lever is in neutral, just like a big car.

The throttle for the motor is one of these outboard motor boat remote control throttles operating through Bowden cable. It is mounted on the forward half of the hood, low to the right near the operator's hand. See Fig. 1 in Part I.

The top of the steering column is supported by a clip of 16 ga. c. r. steel welded to a "U" channel which forms the bow upon which the rear half of the forward hood rests. See Fig. 3. This channel is 3/4″ by 1/2″ in section and must be U shaped to bend evenly.

Building the Body Forms

You might use any steering wheel, even the Ford T. If you wish, too, a wheel can be sawn out of 3/4″ plywood. See Fig. 7. Three spokes will allow proper hand grips.

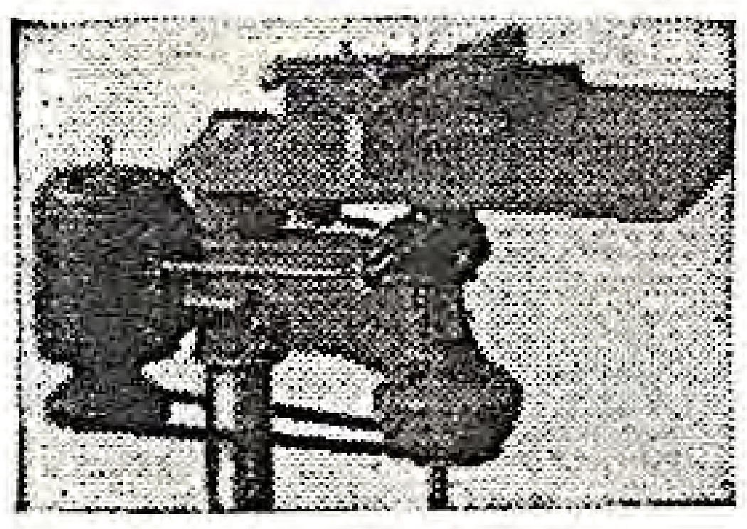
The body of such a car can be built in one of two ways. It can be built out of 22 gauge sheet metal, or it can be formed by using wooden molds with chicken wire and fabrikoid cover. The former is the best and is not difficult. The latter costs more, is a trifle easier, but is not as satisfactory.

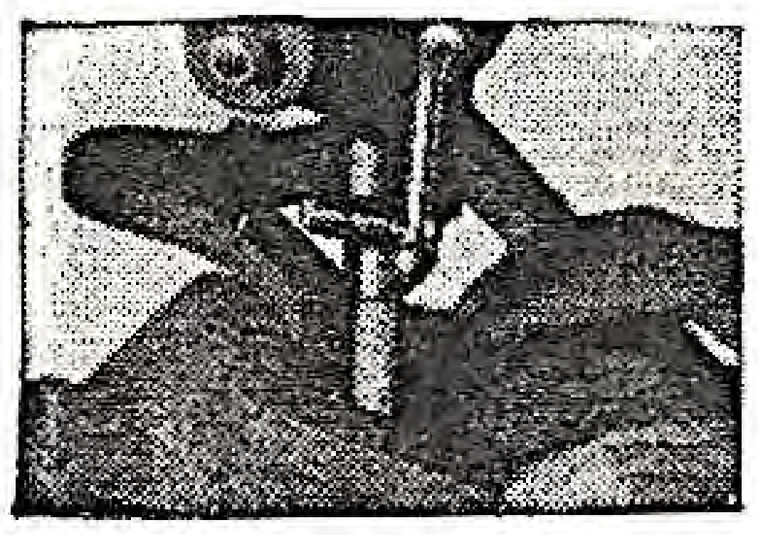
Temporary molds are made for both the front and rear halves of the body. That means a mold must be made for the front portion, and a mold made for the rear portion. Cheap lumber can be used for this, and it can be roughly planked with strips of wood to form a boat-like mold. Then the sheet metal is hammered into shape with a leather faced

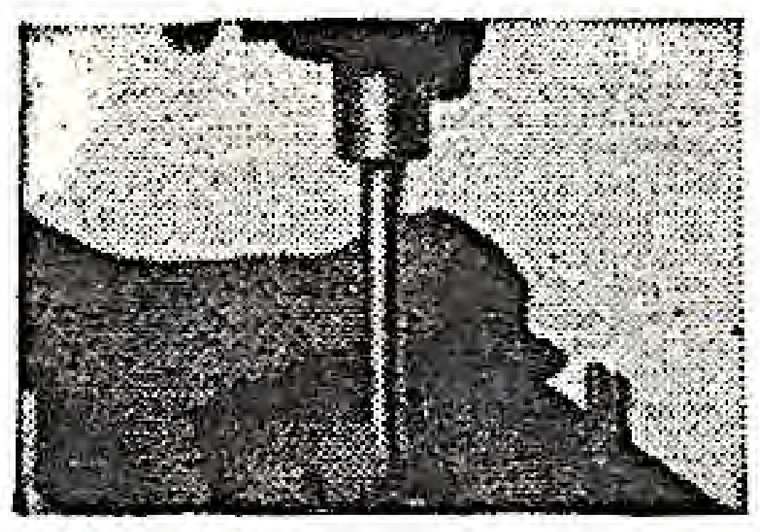
[*Continued on page* 129]

Seven Tools In One

Mortising, Routing, Drilling, Carving, Sanding, Shaping and Surface Grinding


SHAPING


SANDING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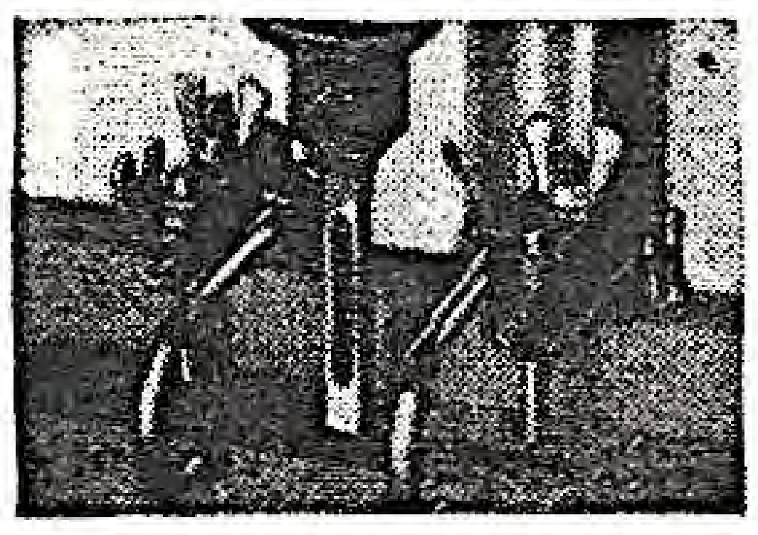
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THIS remarkable new "DELTA" Bench Type Drill Press performs these seven operations efficiently, conveniently and accurately. Is almost a complete workshop in one tool. Built to stand up under heavy production work—yet is priced so low as to be within the reach of every home workshop owner. A brand new "Delta" model, a quality tool throughout—with numerous interesting features. For full details mail the coupon TODAY!

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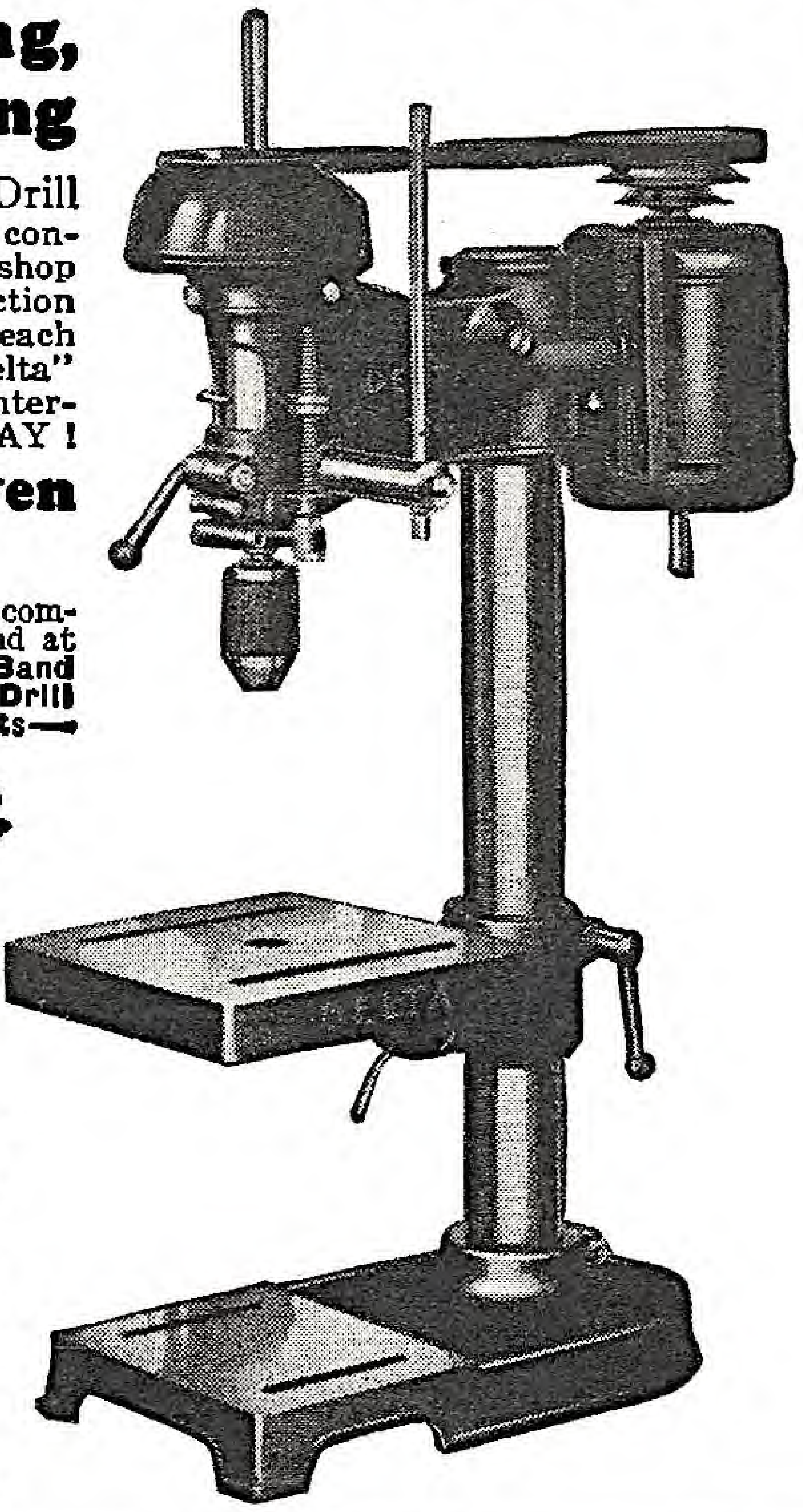
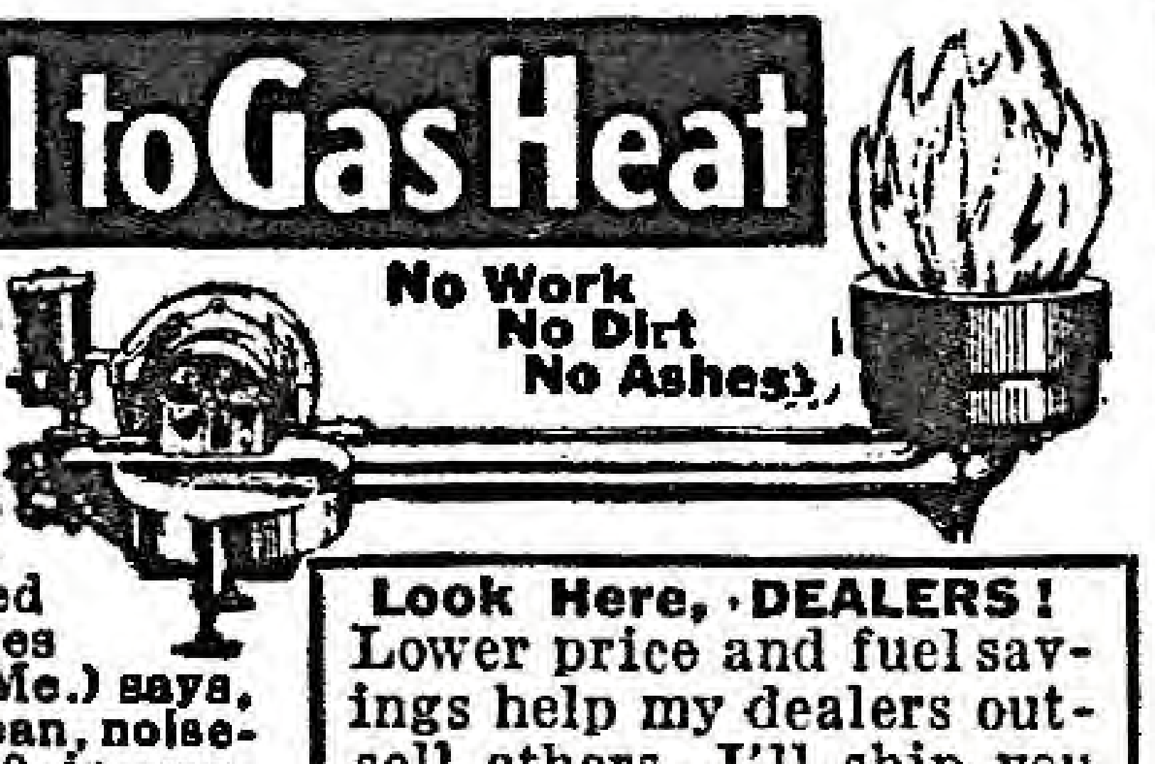
☐ Check here if you are a Delta user now.



Turn Cheap Oil to Gas Heat



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$2 Deposit on COD's. Send 3c stamp for bargain catalog.

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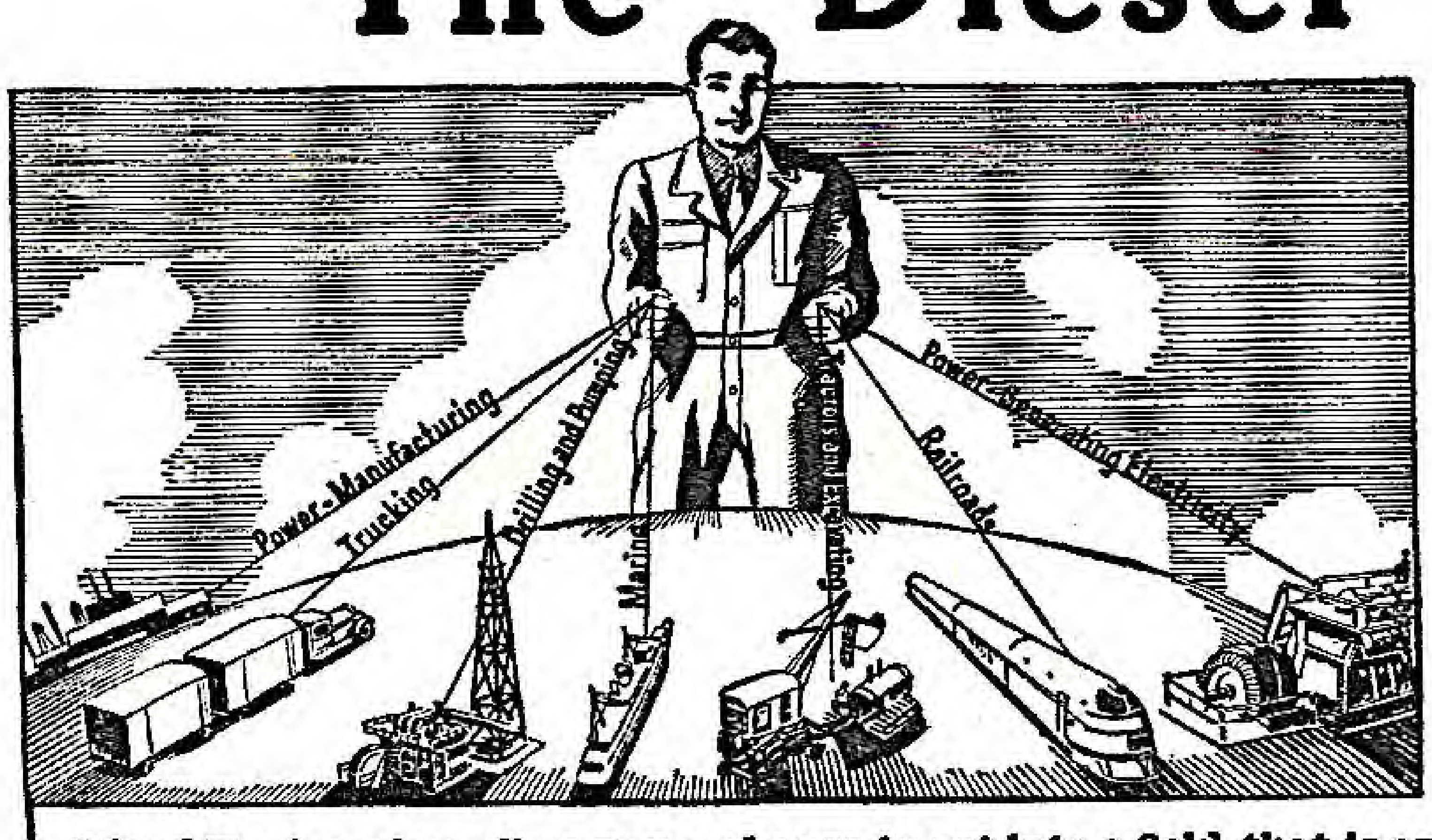
The Diesel Engineer



Diesel engines—because of their high efficiency, dependability and economy of operation—are fast replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives and ships, tractors, dredges, drills, pumps, etc.—opening up steady, well-paid jobs for Diesel-trained men.

You can get the necessary training at home on all the latest Diesel developments—two- and four-stroke cycles; solid- and air-injection fuel systems; low- and high-speed and heavy duty types; Diesel-electric generating systems, etc. Course includes all text material—with special diagrams making possible quick understanding of this new type of power.

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...writes George Bailey

Wear the WEIL BELT for 10 days at our expense!

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REDUCE your WAIST 3 INCHES in 10 DAYS
or it will cost you nothing!
THE MASSAGE-LIKE ACTION DOES IT!

You will be completely comfortable as its massage-like action gently but persistently eliminates fat with every move! Gives an erect, athletic carriage . . . supports abdominal walls . . . keeps digestive organs in place . . . greatly increases endurance.

Fat endangers your health. Insurance Companies know the danger of fat accumulations. So don't wait any longer . . . act TODAY!

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Gentlemen: Send me FREE, your illustrated folder describing The Weil Belt and full details of your 10 DAY FREE TRIAL OFFER.

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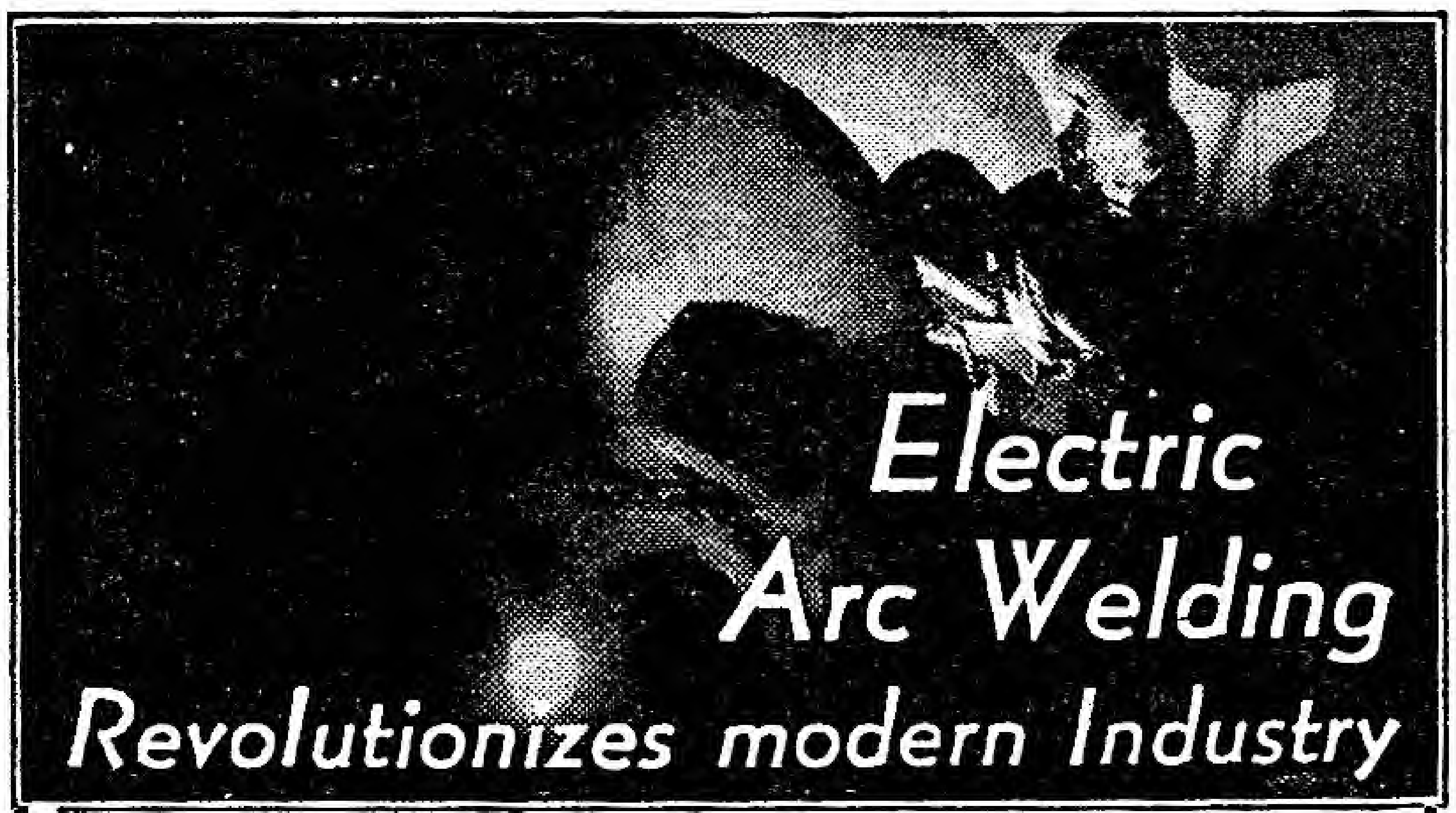

Milwaukee Manufacturers desire to contact earnest men to work and learn **Electric Arc Welding** in their laboratories at the School of Engineering. Small training Fee. Accepted applicants will be fully trained until ready to pass rigid test and assisted in securing employment.

Arc Welding presents one of the outstanding opportunities for steady income and future success. Welding is growing rapidly, replacing large and intricate castings, rivets, nuts, bolts, screws. It is commonly used in assembling cranes, hoists, bridges, structural steel work, etc. No limit to the application of welding to industry, increasing durability and reducing manufacturing cost. There is a decided shortage of properly trained welders. Why be content with ordinary work, hit or miss jobs and low pay when in a short time you can become a trained Specialist in Welding?

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Raise Frogs for Big Profits

[*Continued from page* 102]

sandy loam soils will invariably leak so that proper water levels cannot be maintained. A leaky pond can be made watertight by treating it with clay or "adobe." Clay or "adobe" from any available source is mixed with water to the consistency of a thick muddy "soup," which is then scattered about through the pond. The escaping water will carry the "soup" into the leaks and seal them. Several such treatments may be necessary before the pond is thoroughly watertight. The size of the pond will also determine the volume of the treatment. Following such sealing of a pond fertilization will be necessary to encourage plant growth. Well-rotted cow manure is by far the best frog farm fertilizer.

Raising Food for Frogs

Once the water areas have been prepared and cultivated to a luxuriant growth of the aquatic and shoreline plants known to thrive best in a given locality the culture of frog food becomes the next step. Food culture pools should be created for the raising of crayfish (*Cambarus clarkii*) and top minnows (*Gambusia*). Top minnows and crayfish may be raised in the same pools. A great deal of the food of crayfish is plant life, but they are also scavengers. They will thrive upon almost any organic substance; table scraps, boiled potatoes, stale meat, etc. Crayfish multiply rapidly and may be transferred to the frog pools as needed. A low, solid board fence, or a low fence of closely-woven wire will keep them from migrating from the culture pools. Top minnows bear their young alive and are very prolific. Their growth may be speeded by giving them an occasional feeding of bread crumbs, corn meal, or dried ground shrimp. Top minnows also feed upon the larvae of mosquitoes and are invaluable for abating the mosquito nuisance that would otherwise arise upon any frog farm. They may be seined out of the culture pools and transferred alive to the frog ponds according to the food requirements.

Screen Fences Keep Out Marauders

Dragon flies, water beetles, and various other insects prey upon tadpoles just as turtles, fishes, hawks, owls, shunks, foxes, and various other creatures prey upon both frogs and tadpoles. Tadpoles, however, may be raised under complete protection from the egg to metamorphosis. This is done by placing adult breeders in tadpole rearing ponds screened and fenced against all enemies. The adult frogs are removed from the pond as soon as spawning is completed. Tadpoles are scavengers and their growth is speeded by feeding them boiled potatoes, cooked cereals,

[*Continued on page* 132]

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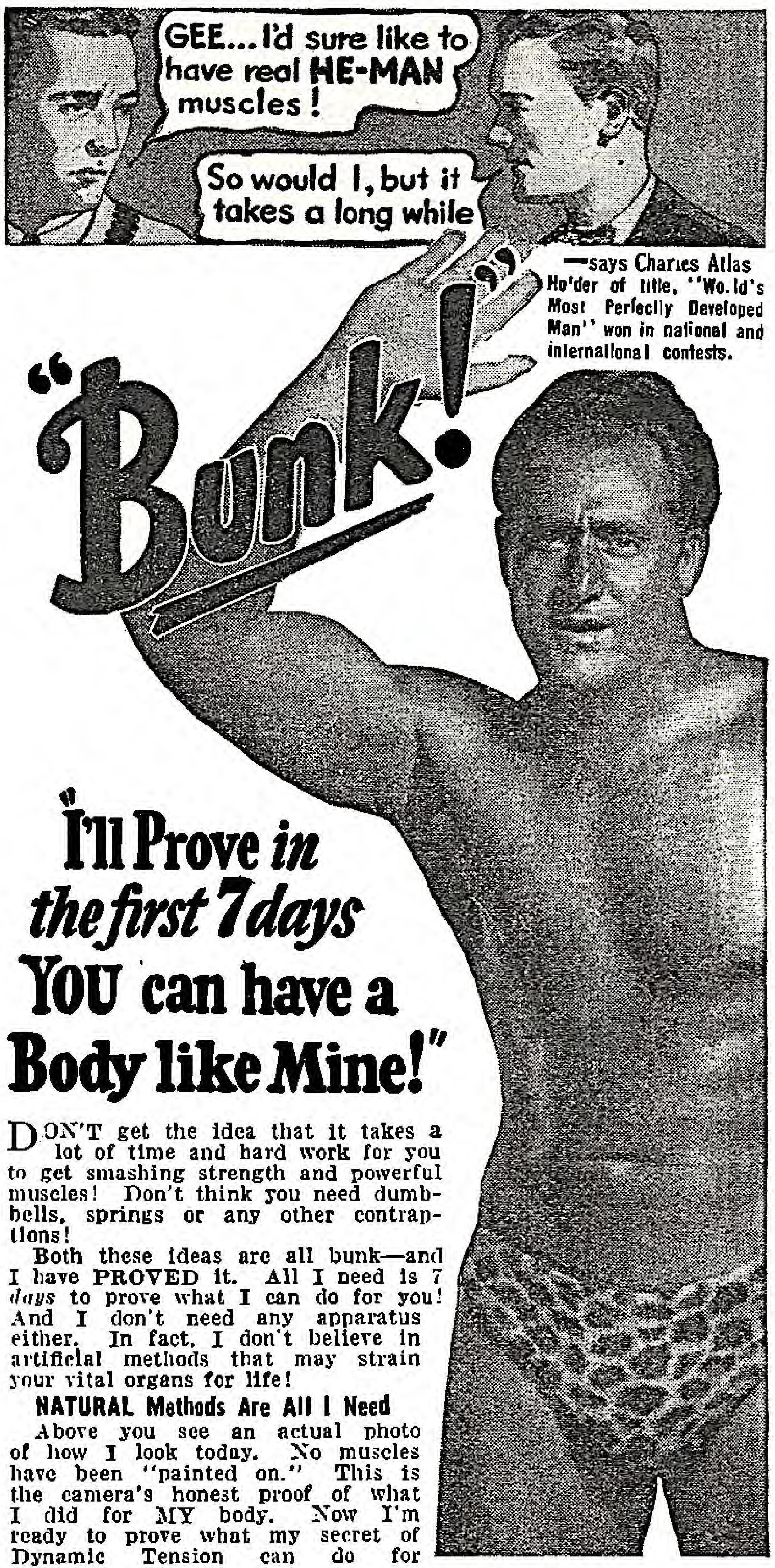
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Smallest All-Electric Radio

[*Continued from page* 92]

the voltage to just about the right value for the filament. To shut off the radio, simply turn out the table light.

While too much should not be expected of this set in the short wave bands, it will give excellent headphone reception on the broadcast bands. With careful adjustment of the antenna trimmer condenser each time a plug-in coil is changed, a surprisingly large number of short wave stations can be picked up. On strong local stations a magnetic speaker may be used with surprisingly good volume.

All parts are mounted on a 3½"x5" metal panel and on a wood base of the same size. Care must be taken that the panel does not come in contact with any grounded objects such as steam or water pipes. Though the tube will not be damaged, one winding of your coil will burn out. Reversing the plug in the light socket will give the proper polarity to ground the set through the electric light line and produce greater volume. Do not touch the metal panel until you are sure the plug has the correct polarity to ground your set.

"Hole-in-Ground" Furnace Plans

[*Continued from page* 98]

8"x12" inside dimensions. The upper half is called the "cope"; the lower, the "drag."

Dig some clay from a creek bank and puddle it in a tub until it is about the consistency of good cream gravy. Screen off foreign matter such as sticks and leaves and let the clay dry into a cake. Now pulverize the cake, mix one part clay to about ten parts sand, and add sand a little at a time until there is a good bond when squeezed in the hand.

Place the drag on a smooth clean board, set in the pattern, and dust with fine sand.

Tamp screened sand into the drag until it is firmly packed full, turn over, dust with parting sand, and set cope in position.

Place a cone-shaped peg upright in the sand near the pattern, then screen and ram the cope with sand.

From the drag, carefully remove the pattern, patch up any defects, and scoop out a groove to the pour hole. Replace the cope, set a weight over the top, and slowly pour in your metal.

To heat the metal, dig a hole in the back yard, a little larger than the graphite or clay crucible you are using and about twice as deep. Dig a small trench from the bottom of the hole and lay in a short piece of pipe.

Attach the hose of the cleaner to the pipe and build your fire in the hole in the ground, using paper and kindling wood. Start the blower slowly, fill the hole two-thirds up with coke, and set your crucible on it.

Secret of Hidden Power

[*Continued from page* 41]

It isn't true. It is not the standard, it's the *new* that people buy.

The immediate need is for new things which the public will feel it can not do without. We must recreate the desire to buy. The world is crying for new improvements on nature. And it is amazing how little we really know about the simplest natural things.

One of our biggest problems is to answer the simple question:

"Why is the grass green?"

When men can answer that question thoroughly, they may have achieved something as important as the discovery of fire. For that question involves the whole vast mystery of how nature turns sunlight into energy.

All Energy Comes From Sun

You plant a kernel of corn or a seed of grass. In a few weeks or months you get a blade of grass or a corn stalk weighing many hundreds of times as much as the original seed. Then you can burn the stalk, put the ash back into the ground for fertilizer, plant another seed, and the whole marvelous process takes place again. Nature takes the sunlight and converts it into energy.

If we can find out exactly what reaction takes place between the blade of grass and the sunlight which beats down upon it, we may be able to transform sunlight into energy ourselves.

Every bit of energy used by mankind came originally from the sun. The sun, beating down on prehistoric forests, produced the coal which we burn in the boilers that turn our power generators. The sun, beating down on rivers and oceans, keeps in operation the continual circulation of water over the face of the earth which turns our turbines at Niagara or Keokuk.

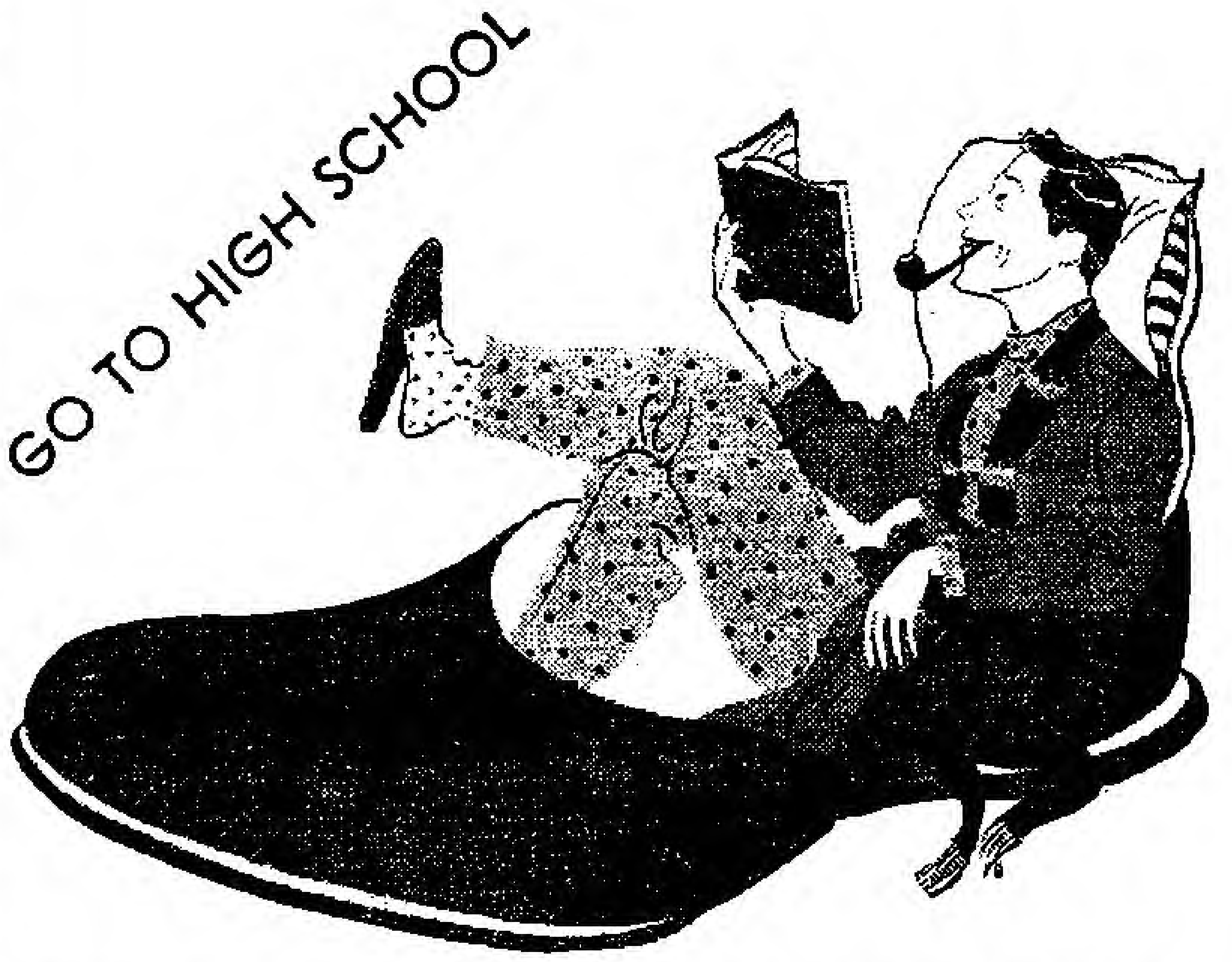
Keep Trying for Success

But at present, not knowing the processes of nature, we have to let her take her own time. We can use only the energy which she has stored up. If we can find out exactly why the grass is green perhaps we can put the sun to work for us—and what vast wonders that may accomplish we can only guess.

Thus the future progress of civilization depends upon research. If civilization is to go steadily forward the research "state of mind," must not be limited to the fields of mechanics and invention. It must spread into all fields of thought.

Try it out in your own life. Write "why?" after everything. Select an audacious goal, keep your mind open, and keep trying.

That is the way to success. And that is also the way, incidentally, to keep from growing old.



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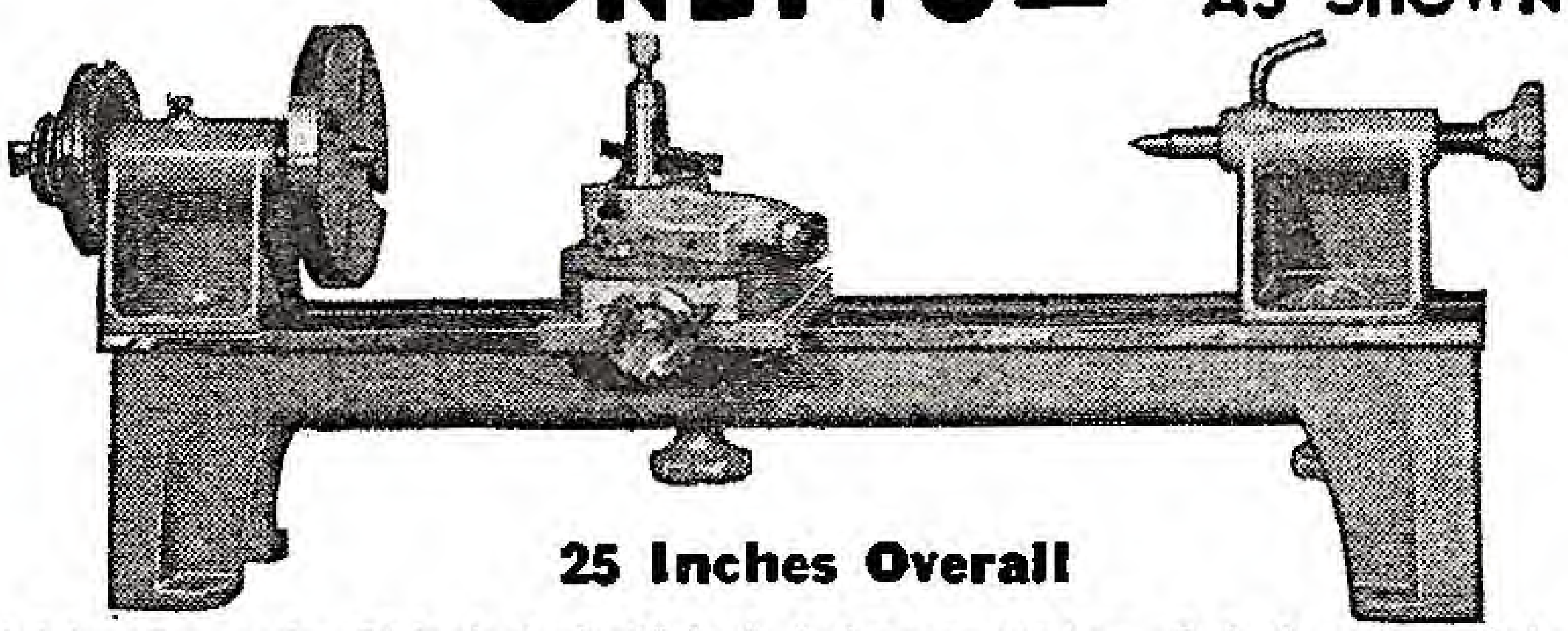

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Unfolding Mysteries of Fly Casting

[*Continued from page* 75]

gives it the spring and impetus that impels it forward when the forward cast is made. It can readily be seen that if the line is too light to pull the rod back and give it this spring, it falls flat and has no energy running through its length.

It is not necessary for the beginner to practice on the water. A close-shaven lawn or a golf green will do if there are no bushes or trees to hinder the back cast. In the initial casting it is not necessary to have a leader on the line. Snip off the barb on a No. I-O bass fly, preferably white, as that shows up better on the green, and tie this directly to the end of the line. A bit of white flannel rolled up and tied to the end of the line can also be used.

Mark a place from which you are to do your casting, and then at 25, 30, 35 and 40 feet from you, place at each point a white paper target, the idea being to work these distances, to place your fly on the same.

Fly Casting Not Arm Motion

A careful examination of Fig. 1 will give the reader a practical idea of the position of the rod at the termination of both the forward cast and the back cast. Permitting the horizontal and vertical planes to run through the center of the reel, you will get an idea just how far to carry the rod to acquire the best results. The rod is carried backward over the right shoulder to 15° past vertical, or to about one o'clock on an imaginary clock face, before the rod is brought sharply forward to the dotted line showing the forward position at 45° or 10:30. At this point the rod is stopped momentarily to permit the line to go forward, after which pause the rod is dropped forward in what is known as the "drop" cast.

Fly casting is not a full arm motion. The elbow is held fairly close to the side of the body, while the wrist is permitted to put power into the forward cast, with the pressure of the thumb concentrated on the handgrasp. The thumb lies flat on the cork and never circles under the grasp.

Left Hand Controls the Line

In initial casting of the fly it is not necessary to carry a coil of line in the hand. Merely have a foot or so of line held in the left hand, between forefinger and thumb, the hand outstretched to the left side, and when the forward cast goes out, feed this line forward by moving the left hand toward the first guide on the rod. The left hand fingers are hardly ever off of the line, except when using a very short line. The left hand controls any surplus line that may have gone out, and pulls it back. The line should not be completely released by the left hand. The left hand, con-

[*Continued on page* 130]

Is The Dirigible Doomed? — No

[*Continued from page* 33]

1920, and the loss of several built and flown with hydrogen by foreign governments in more recent years. Since helium became available the United States government has owned and operated four helium airships, three of which have crashed from structural failures or a combination of structural failure and unskilled handling.

Our brief experience in the field of dirigible development has proved nothing more than these three things—(1) That the use of helium has eliminated the peril of fire and explosion in lighter-than-air craft. (2) That we have not yet mastered the engineering problems of building dirigibles that are structurally safe. (3) That we have not developed the necessary skill to operate them.

Those maintaining dirigibles are a failure forget that Zeppelin passenger service was inaugurated in Germany in 1910 with luxuriously-appointed dirigibles, and that these airships, *flown with hydrogen,* made 760 flights carrying 14,000 passengers about half a million miles up to the World War. They forget the German *Graf Zeppelin,* which *flying with hydrogen* has met every requirement of a successful airship for ten years.

There is nothing new about those persons now advocating adandonment of further dirigible development. They're the modern version of unimaginative men who jeered Robert Fulton and his steamboat. They thought the Wright Brothers were madmen. Their taunt to the stranded motorist of 1904 was—"Get a horse!"

Is The Dirigible Doomed? — Yes

[*Continued from page* 32]

been dashed with each major dirigible disaster until, at last, I find myself forced to admit that the principles of lighter-than-air flight are fundamentally unsound and can never be made otherwise.

The aerial buoyancy of helium is slightly less than hydrogen while the weight of air that must be displaced to make a dirigible float is governed by the unalterable laws of physics. This means that an airship to attain maximum lifting power and minimum wind resistance must be flown with hydrogen, and if we use hydrogen we retain the hazards of fire and explosion.

The loss of the Shenandoah, Akron, and Macon has proved that the hope of a safe and reliable helium airship is an idle dream. In order to utilize helium and attain the speed, cruising range and lifting power demanded in these ships it was necessary to build them to unprecedented size. This subjected them to

[*Continued on page* 142]

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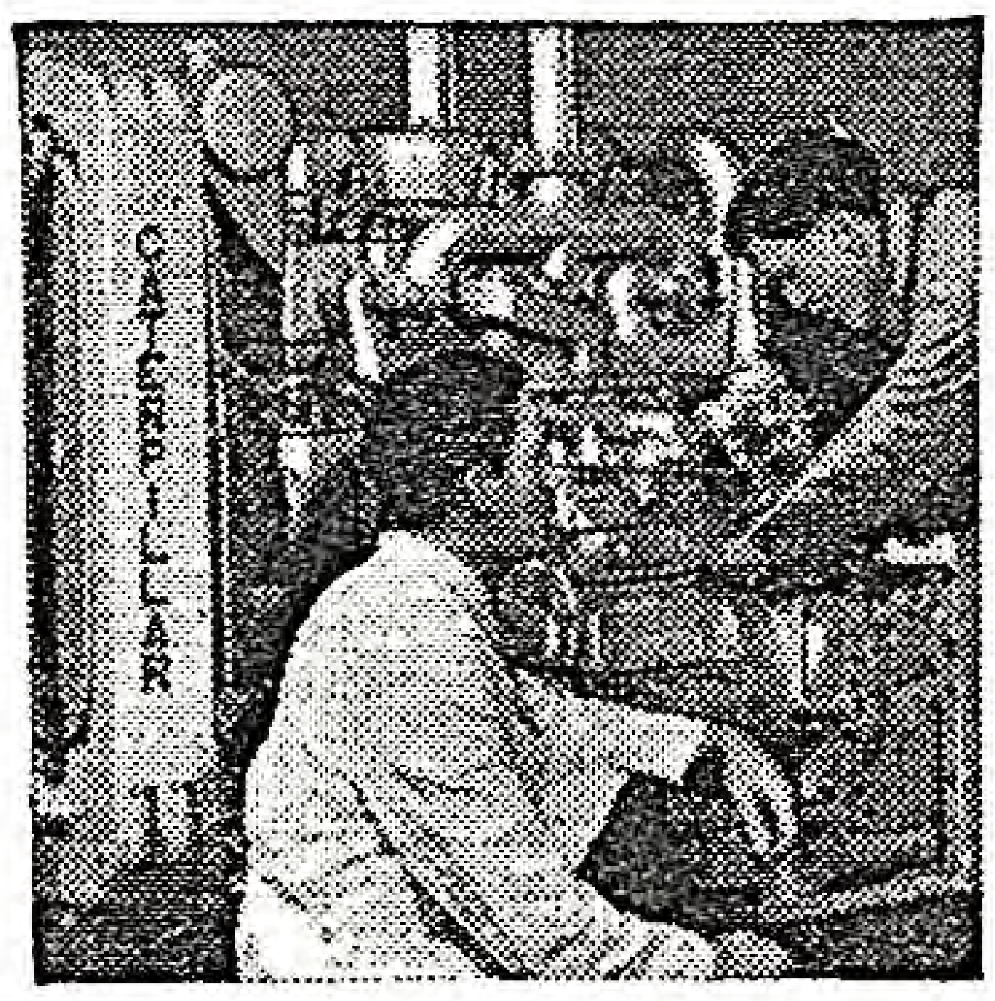

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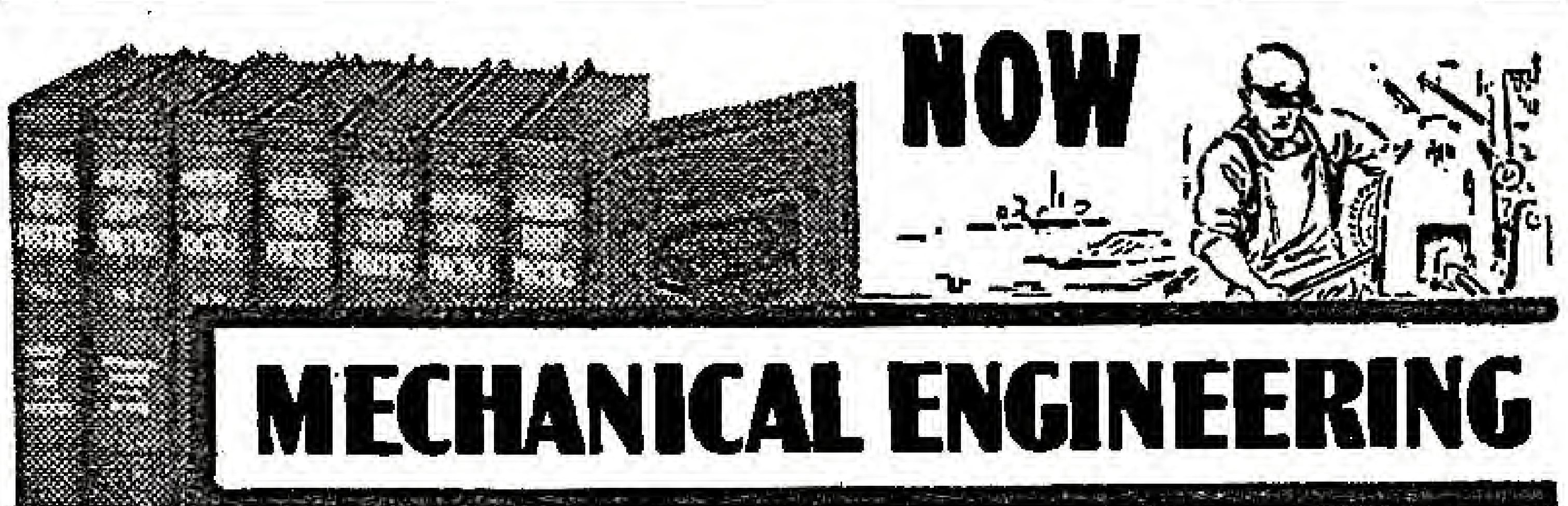

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Build This Collapsible Trailer

[*Continued from page* 96]

upon these posts while the remaining uprights are capped with a ¾"x2" strip as shown in Fig. 4.

Before nailing these cap strips in place drill them at the proper distances for the 1" pipes which should project through the stripping. These pipes form part of the ingenious system employed in raising and lowering the roof. They are secured along the frame at the points indicated by ordinary pipe flanges, sawn off as shown in the detail drawing (Fig. 6) and bolted to and through the flooring with 1½" lag screws. Therefore it is necessary to lay the flooring before proceeding further.

The floor should run crosswise to the keel in order to increase rigidity. Make a neat job laying the grooved wood flooring by slanting your nails towards the last board laid.

Pressed Wood Used for Siding

With floor laid and edges trimmed take the eight pieces of pipe and bolt them in place. Although the specified length is given as 42 inches it is best to check this against your body frame so that not more than ¾" of pipe projects through the cap strip. The $\frac{3}{16}$" plug holes which you have previously drilled should be in line with the cap strip. A steel bracket is added to each of the posts forming the door jamb as shown in Figs. 4 and 7—screw them directly into the floor. Now for the pressed wood siding; interior detail, and such items as the door and the upper jamb.

Better make the latter first. As shown in Fig. 7, and the detail drawing, Fig. 9, the upper jamb is simply two pieces of 2"x2"x30" spruce hinged to the lower posts so that they may be swung down and inboard when the top is lowered. The lag screw with head cut off (and preferably rounded by filing) set into the head of the jamb forms a stud which is used to engage suitable slots or holes in the roof frame. As you may have wondered why no pipes are specified for the door side of the body we will explain that the door jamb posts take the place of pipe supports on this side.

Trim Body With Angle Iron

The door, if you do not obtain one from a sash and door factory, can be made as shown in Fig. 8. It is in two sections; the bottom part secured with pin butt hinges, and the upper part attached to the lower with the type of spring hasp used on auto trunks.

You are now ready for the pressed wood siding. This comes in large sheets and is sawed to fit. Trim the corners and lower edge of the body with lightweight angle iron. Wood or brass trimming may be substituted to save money but angle iron is recommended. Do not trim the top edges of the body with moulding at this time as it will be utilized to

Build This Collapsible Trailer

hold the canvas covering in place when you fit the top.

The interior may be finished off with plywood after you have installed your lockers and other furnishings. The bunk lockers, running along the sides and over the wheel guards allow for seats and form the inner part of the bunk shelf. Details of the hinged bunk shelf will be dealt with in Part II next month. Interior detail is left to the builder. Harry riged a clever sink arrangement in Sir Guy's trailer whereby the water tank, of galvanized iron, can be lifted off and carried to pump or spring for fresh water. Such a tank is suggested in the drawings (Fig. 7).

The exposed wheel wells can be covered with detachable fairing if so desired but it is not essential. Simply use heavy gauge metal sheet cut to the exact contour of the opening and drill at intervals to fit ¼" stud bolts which are inserted behind the body frame and project through the wheel guard flange. Slip the fairing over these bolts, add a trimming strip of brass or aluminum and secure with spring washers and wing nuts.

Now to tackle the top and complete the bunks. Watch for the next issue of MODERN MECHANIX AND INVENTIONS—it contains complete information on finishing the trailer.

Completing Midget Miller

[*Continued from page* 120]

hammer, using a bag of heavy shot in a leather sack as an anvil and buck-up.

The center seams are welded, and filed. See Fig. 6.

The seat back is framed as shown in Fig. 5. A burlap pad is built up with mohair or other upholstery filler in it, and over this leatherette —black fabrikoid, or other synthetic leather is tacked tightly, and finished off with a beading.

The seat itself is a board resting between the separators of the frame.

The radiator is typically Miller in appearance. The one shown in the photographs was cast. It is suggested, however, that a neat one can be made out of 22 gauge c. r. sheet, cut in two halves as shown in Fig. 8, and with brass bars soldered in to form the grid. The entire job can then be nickel plated.

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Unfolding Mysteries of Fly Casting

[*Continued from page* 126]

trolling the line, is important in fly casting.

When your forward cast goes out it is easy enough to mark where the line and the lure falls, but you cannot see what happens to the back cast.

When to cast forward is generally told by what may be termed as a "pull" on the line, but this will be almost imperceptible if the line is light.

It is possible by counting to tell when to cast forward. For an ordinary cast count: "One, two, three, four" and cast forward when you say "four." See Fig. 5.

In actual fishing it is necessary, so far as possible, to have the fly fall to the water first instead of the leader first and the fly directly thereafter.

How to Aim the Fly

The impulse of the beginner is to spot a place and aim his fly at it. This is wrong. Instead of casting directly at the spot, cast at an imaginary point about two feet above the spot. Several methods of dropping the fly naturally may be mentioned:

(1) As the line shoots forward to the imaginary mark, two feet above it, raise the rod tip about a foot and at the same time draw backward a foot or so with the casting arm. The upward impulse of the rod will check the line, while the backward movement of the arm will extend to the fly and pull it down to the water. See Fig. 2.

(2) Another method of accomplishing an easy dropping of the fly to water is by shooting the line, held in coils in the left hand at the moment when the forward cast reaches its termination and exerts a pull on the line in the left hand. When this pull occurs, a little line is fed out, which puts a damper on the energy in the line and slows it up.

Playing the Fly On the Water

When the fly or flies are actually in the water they are moved with twitches of the rod tip to give them the desired action and lifelike animation. As these twitches are given, the rod is being gradually raised. See Fig. 3. At the same time you are twitching with the rod and raising it, your left hand is also working the line toward you, down and off to the side. Then reach forward toward the guide of the rod and take a coil of the line. (See Figs. 6 to 9.)

When the fishing process of the fly is completed, and you are ready for another cast, lift up on the rod to take the slack out of the line, and then pull the rod sharply back for the back cast. (Figs. 4 and 5.) Then as you cast forward sharply, there will be a considerable pull on the line, and as the line hisses forward overhead, feed out the line.

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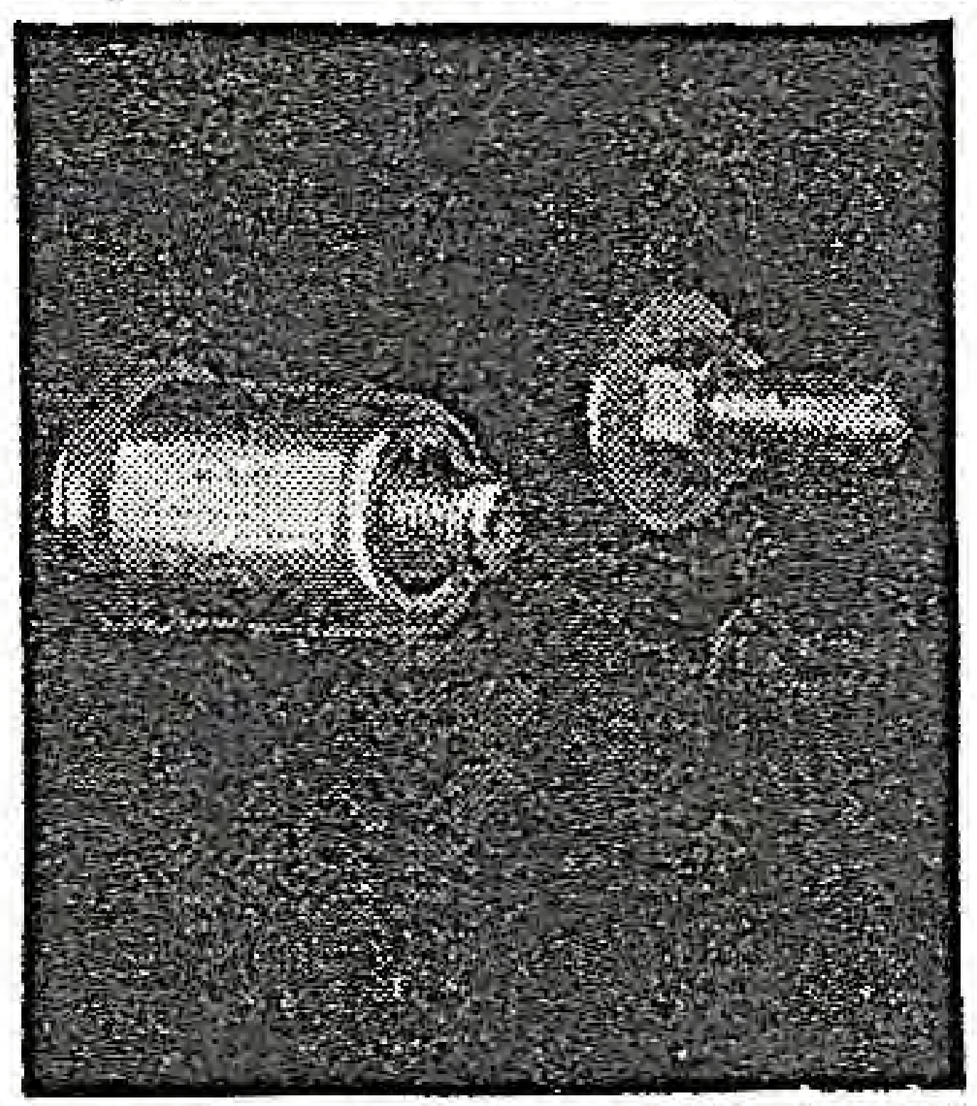

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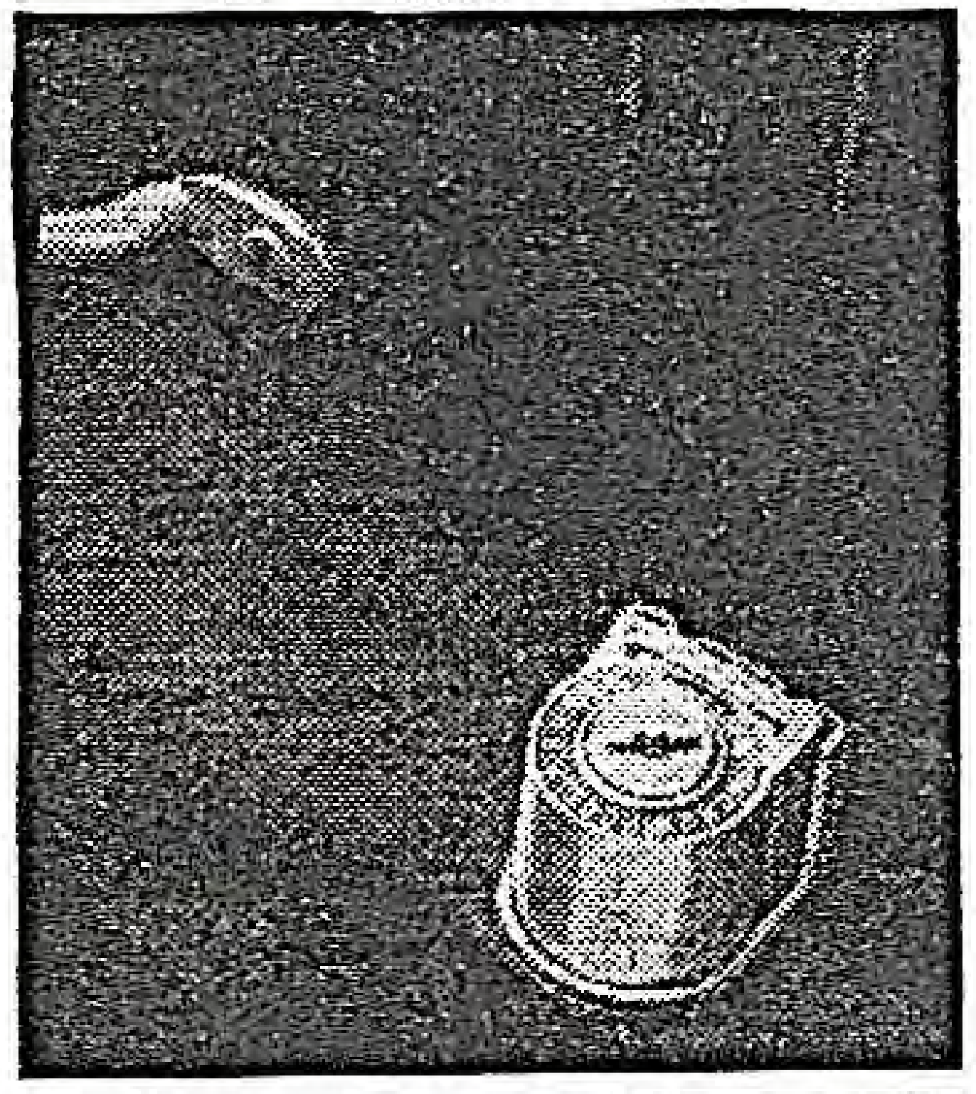

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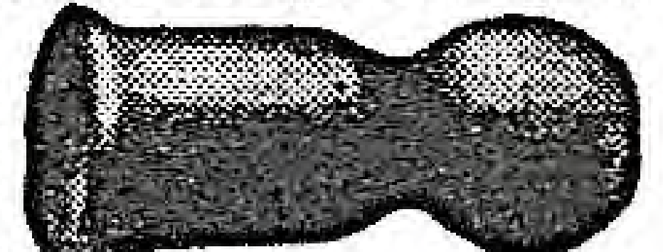

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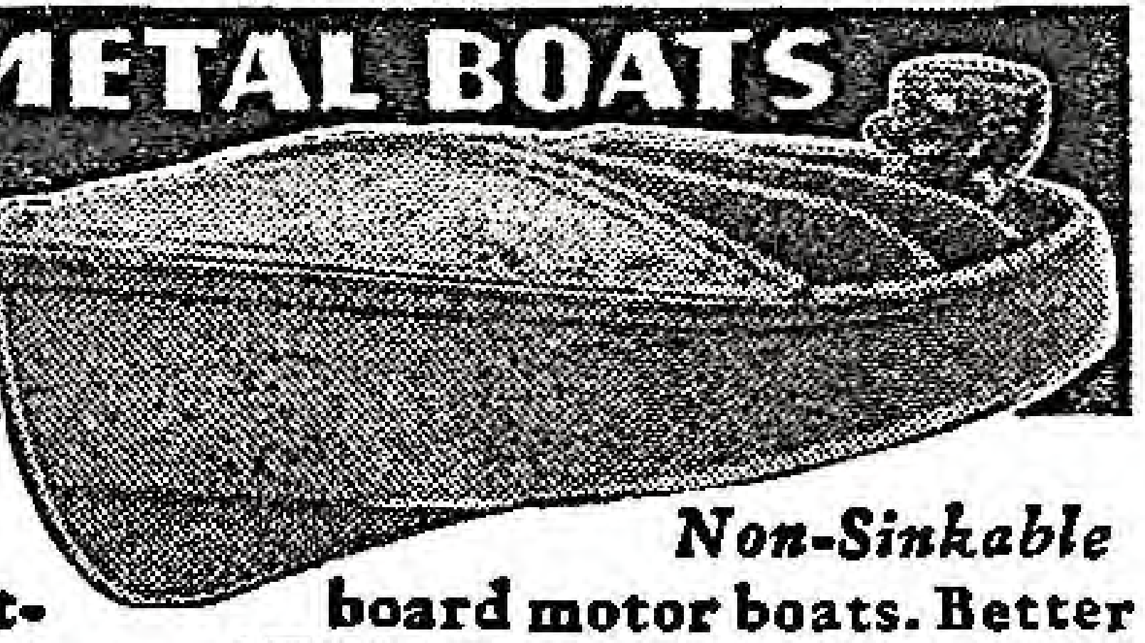

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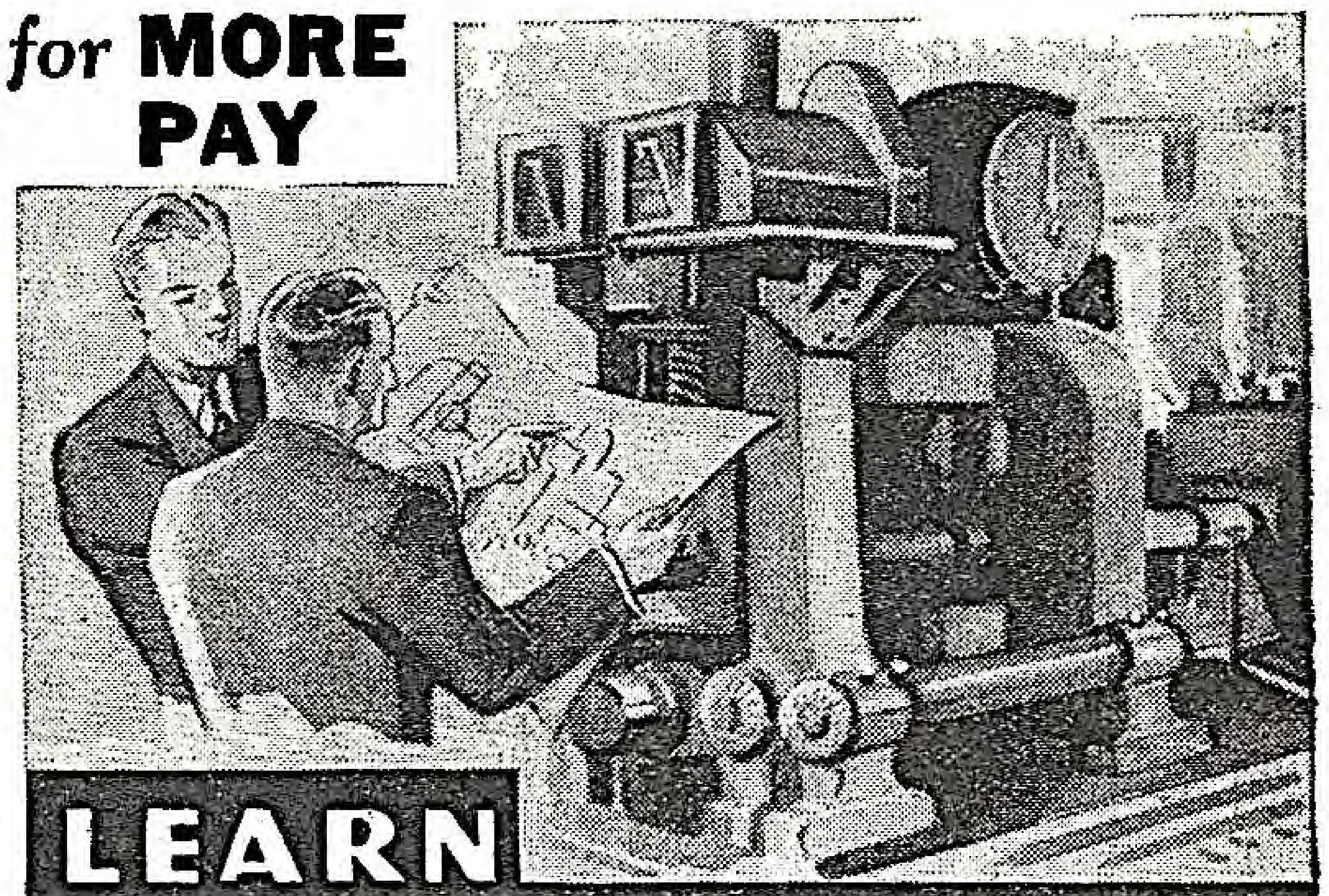

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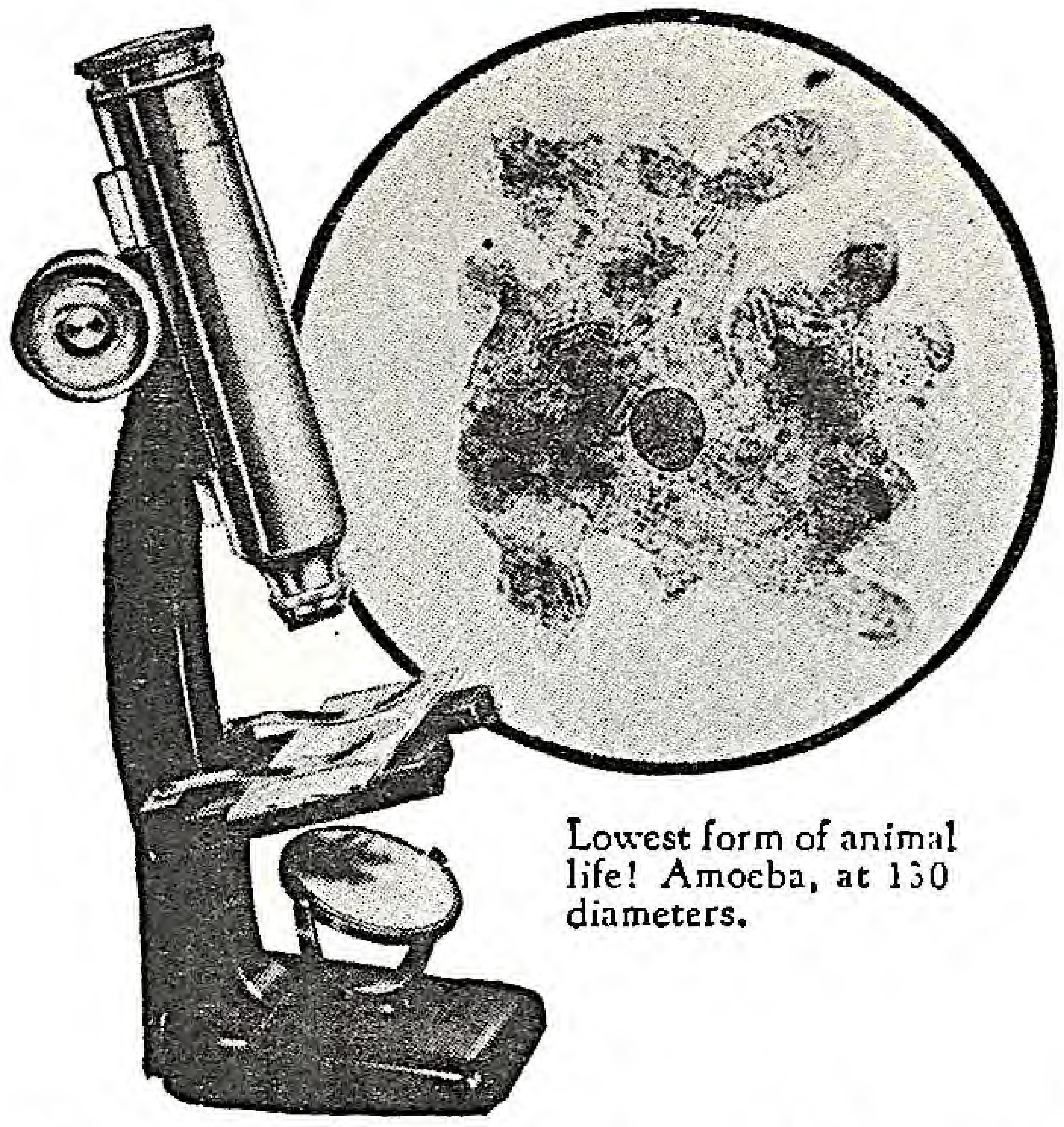
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Microscope Will Identify Trees

[*Continued from page* 61]

tions of known species of trees. It is not difficult to prepare thin sections of different woods for microscopic study.

Longitudinal wood sections are made with a very sharp plane, this being set to cut as thin a shaving as possible. Thin sections across the grain are cut either with a razor blade or a home-made microtome. These sections are much easier to obtain if the wood is soaked first in water for a few days.

Photo-micrographs are made of wood specimens in much the same manner as of slides. The thin sections are placed on glass slides, without cover plates, and studied under low power magnification exactly as with ordinary slides. An article on "Taking Micro-Photos With Your Own Camera" appeared in the December 1934 issue of MODERN MECHANIX AND INVENTIONS.

Raise Frogs for Big Profits

[*Continued from page* 122]

and almost any available organic substance. In the southern states frog eggs become tadpoles in about three days and metamorphosis occurs in from 100 to 180 days.

It is after metamorphosis takes place that the feeding of frogs in concentration assumes enormous proportions and it becomes almost impossible to feed or retain all the baby frogs that can be produced by protected tadpole culture. Many farms find it advisable to feed back to older frogs about 80 per cent of the younger frogs.

Another method is to augment the food supply of crayfish and top minnows by the attraction of insects. This may be done by placing honey, syrup, or other substances along the shorelines in the daytime and the use of lights over pools at night. The frogs soon become accustomed to the lights and gather around to feed upon the swarms of moths, beetles, etc., which are attracted.

Scarecrows, especially if they are animated by the wind or by mechanical means, are useful for keeping herons, hawks, owls, and other predacious birds out of frog ponds. Their use, however, should be augmented by the use of wires strung across the ponds about one foot apart to exclude such birds.

Frogs to be marketed or transferred from one pen to another are easily picked up by hand or with a small net by working at night with a flashlight.

Frogs for breeding purposes should be purchased only from dealers of known integrity. Reputable dealers sell breeders selected from choice domestic stock. They are hand captured or netted and shipped in crates or boxes with canvas or burlap sides in which the frogs are not liable to injure themselves.

Training Tomorrow's Baseball Stars

[*Continued from page* 63]

The first two weeks of the training season, between the period of 10:00 to 12:30 p. m., are confined chiefly to exercise and instruction to the younger players. To insure plenty of leg-work, the player must circle the ball field two or three times at a trot at the opening and close of the session.

Afternoons Devoted to Rookies

To alleviate sluggishness during the afternoon session, the clubhouse lunch seldom consists of more than a sandwich and a glass of milk. During the first ten days of training, older players may be dismissed in the afternoon to permit the manager to devote his time to the rookies, thus detecting little things which form the dividing line between major league possibilities and mediocrity. It is at the afternoon session where rookies may make or break themselves.

The task of weeding out rookies who show no major league promise or who may not be ready for the big time offers managers much difficulty. Only in extreme cases is a rookie dropped before the start of exhibition games. Many of them show considerable talent during the first two weeks of the training season but fall flat in exhibition games.

A pitcher, for instance, may be a demon for fooling batters during batting practice but will show tendencies toward wildness during actual competition.

Cool-headedness is Desirable Trait

Similarly, a manager may be highly elated with a rookie's ability to field ground balls in practice. In actual competition, however, the young player may become jittery and overplay a ground ball. In effect he lets the ball play him instead of playing the ball himself, which accounts for his charging too quickly at a grounder and thus fumbling it.

One of the principal requisites for major league caliber is coolness under stress and a manager can quickly detect this shortcoming in a young player. In many cases, constant practice will eliminate this.

Willingness on the part of a rookie to listen to advice is often an asset which may offset many another fault. Baseball is not without its human qualities and a manager hesitates a little longer when he has found a young player who shows this trait. Once it is found lacking, there is no doubt of the rookie's future. He won't be a major leaguer.

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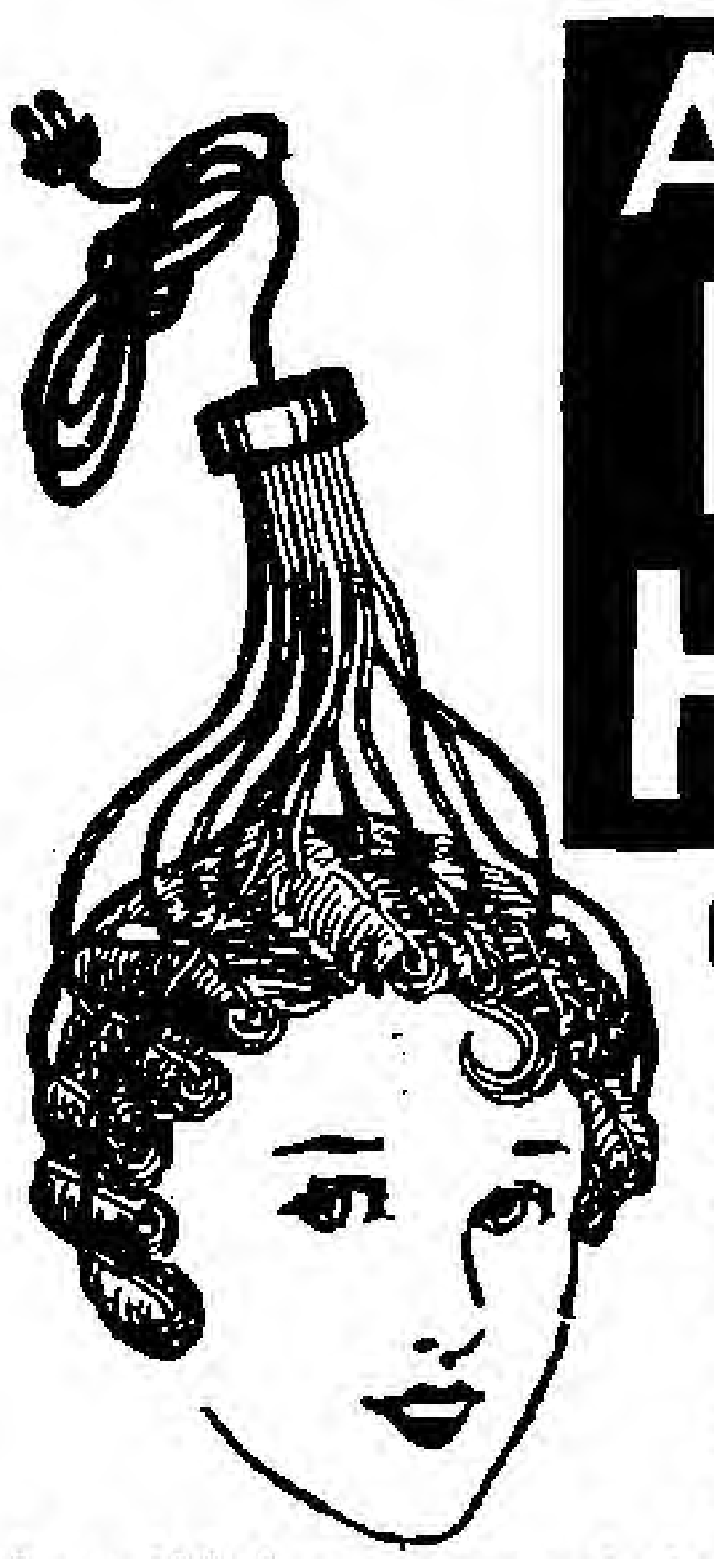

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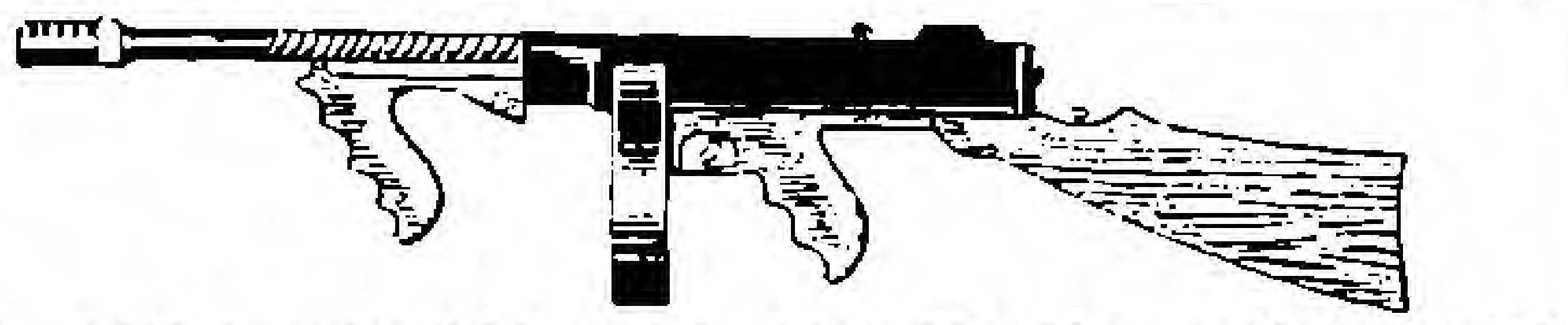

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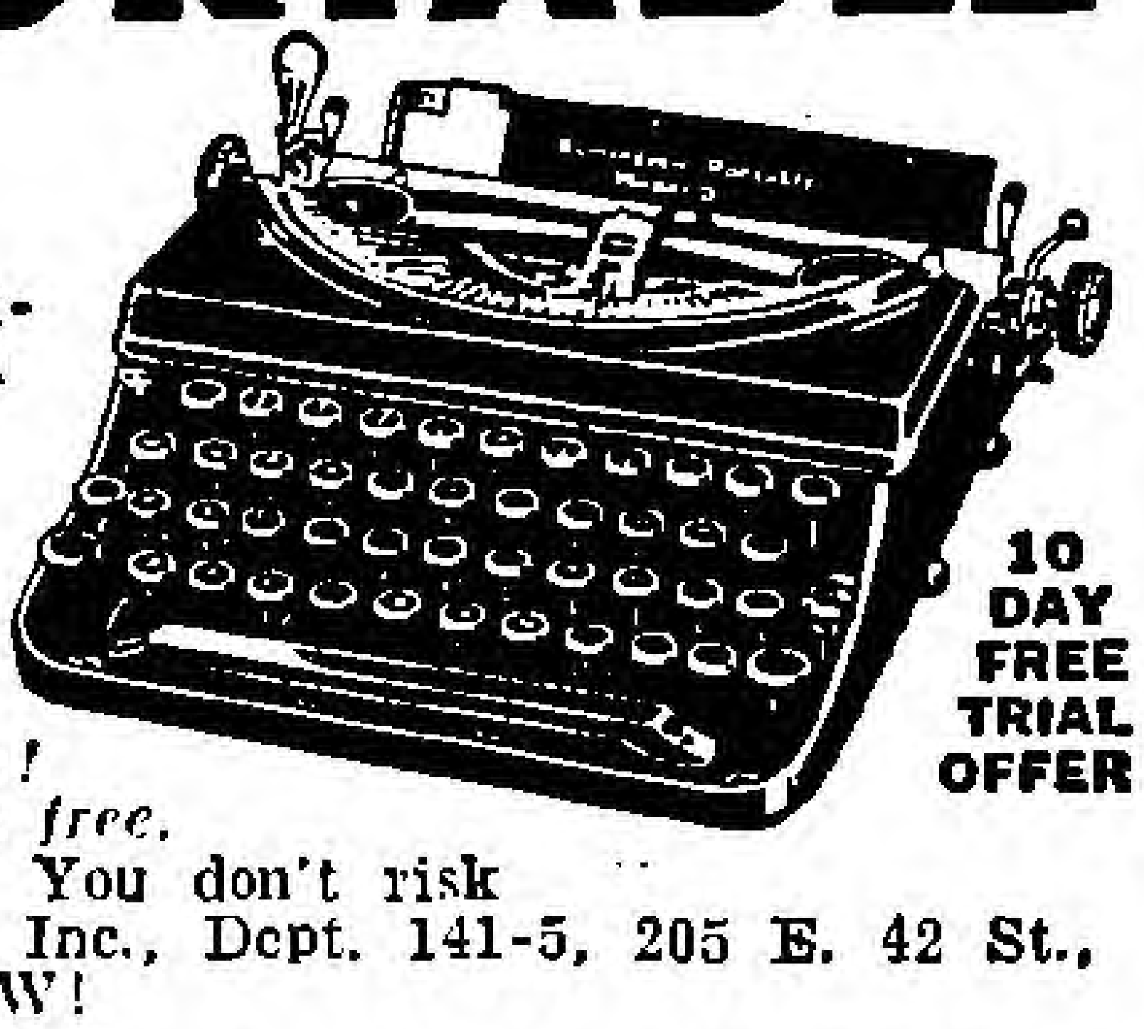

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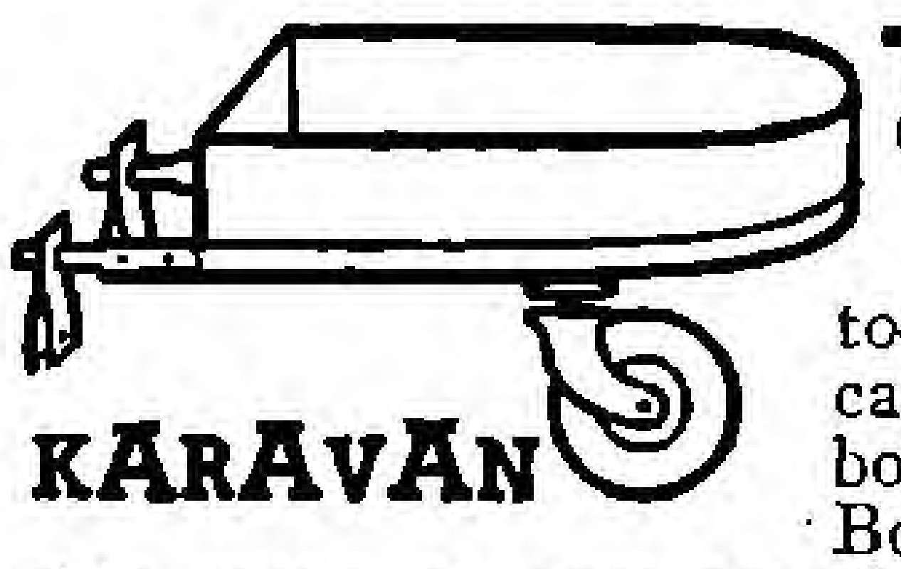

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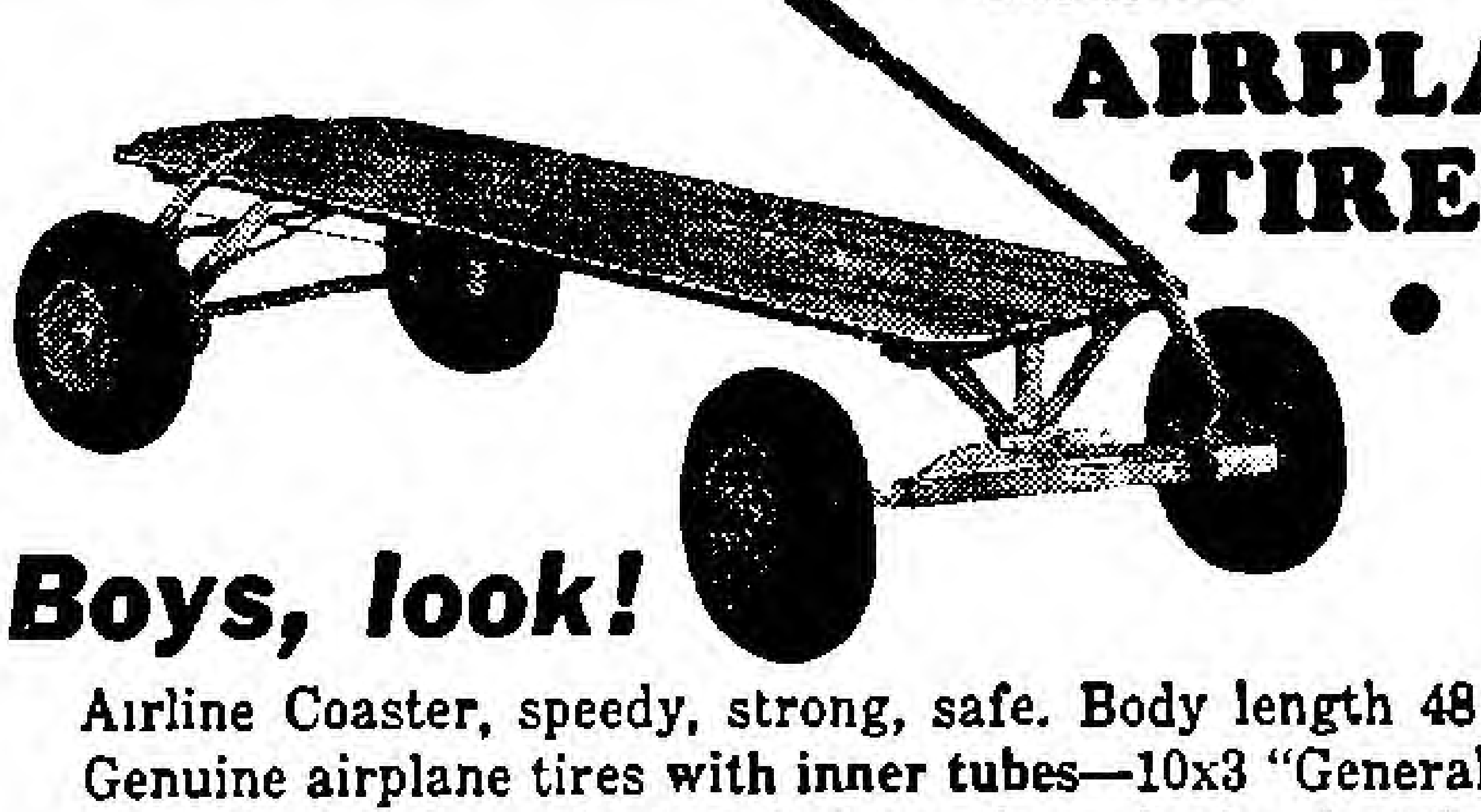

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JAHANT CO. 626 E. Exchange St. Akron, Ohio

A Drama of Power

[*Continued from page* 48]

distant from the river. At that point it begins to flow by gravity 142 miles to Cajalco reservoir, near Riverside, thence through a gravity distributing system to factories and home in 13 Southern California cities.

Thus the Colorado provides by the fall of its own water at Boulder Dam the power which lifts from its bed 150 miles distant a billion gallons daily for delivery to the very edge of the Pacific!

Tunnels Carry Water Through Mountains

Through a series of tunnels, conduits and siphons now being driven through mountains and cast in place on the desert this large volume of water will flow. Twenty-nine tunnels, each 16 feet in diameter, total 92 miles in length. One hundred and fifty inverted siphons, totaling 29 miles in length, carry the water across valleys and depressions in the desert terrain.

The many "inverted siphons" are not true siphons, for they exert no siphonic action. They serve merely as pressure pipes in which the water will find its own level.

Traffic is a problem in these huge aqueduct tunnels just as surely as it is on our city streets. Trains hauled by electric locomotives carry men and equipment in, blasted rock and dirt out. The "grasshopper" and "cherry-picker" are ingenious mechanical devices which lift the empty cars high enough off the tracks to permit the passage of loaded cars underneath.

Although workers frequently spend eight hours daily two or more miles from the light of day—particularly in the East Coachella tunnel—air is delivered through large conduits.

All-American Canal Is "Big Ditch"

While these closed concrete lined carriers will carry water to the Los Angeles area, the All-American Canal will be an open ditch. It will take water from the Colorado immediately above Imperial Dam, where a desilting works will remove the dirt.

From that point the canal parallels the Mexican border only a few miles south. The main canal terminates near Calexico, Calif., to supply water to 500,000 acres, the largest irrigated area in the world. Eventually a branch will extend northward from the west end of this "big ditch" into the rich Coachella Valley, the "fruit empire" of America.

Monster draglines, weighing 650 tons each, and equipped with 12 cubic yard dippers, are scooping dirt from the earth to prepare this waterway.

The All-American Canal is 80 miles long, 22 ft. deep, 218 ft. wide at the water line and 130 ft. wide in the bottom. Among the sand dunes the depth of excavation will be 100 feet.

WOOD IN CANS WILL MAKE THESE SCREENS AS GOOD AS NEW!
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Loose handles—floor cracks—leaky windows—loose casters—broken chairs—loose drawer pulls—cracked shelving—plug old screw holes—cracked bathroom tile—patching auto tops—cover countersunk screws—around pipe holes—loose bathroom fixtures—damaged toilet seats—drainboard cracks.

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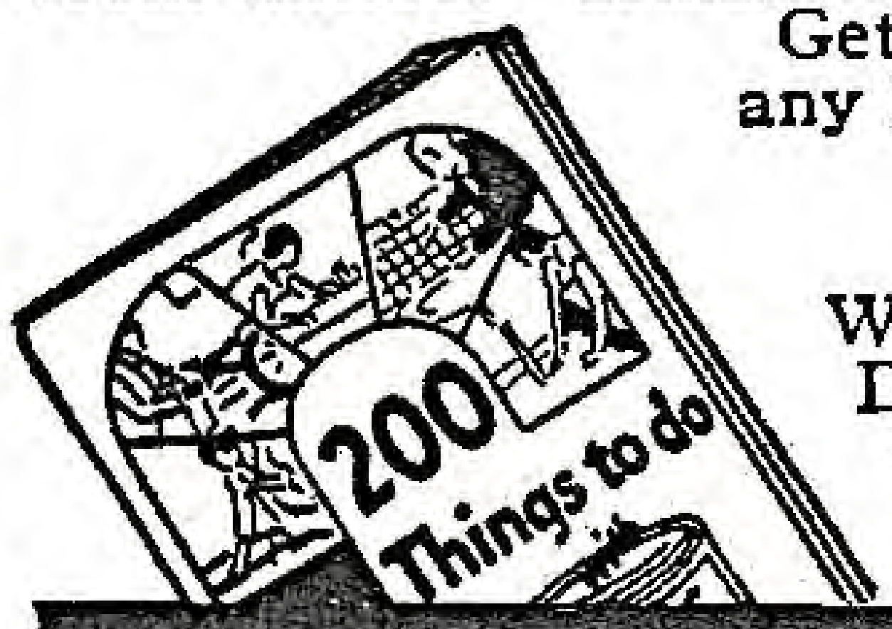

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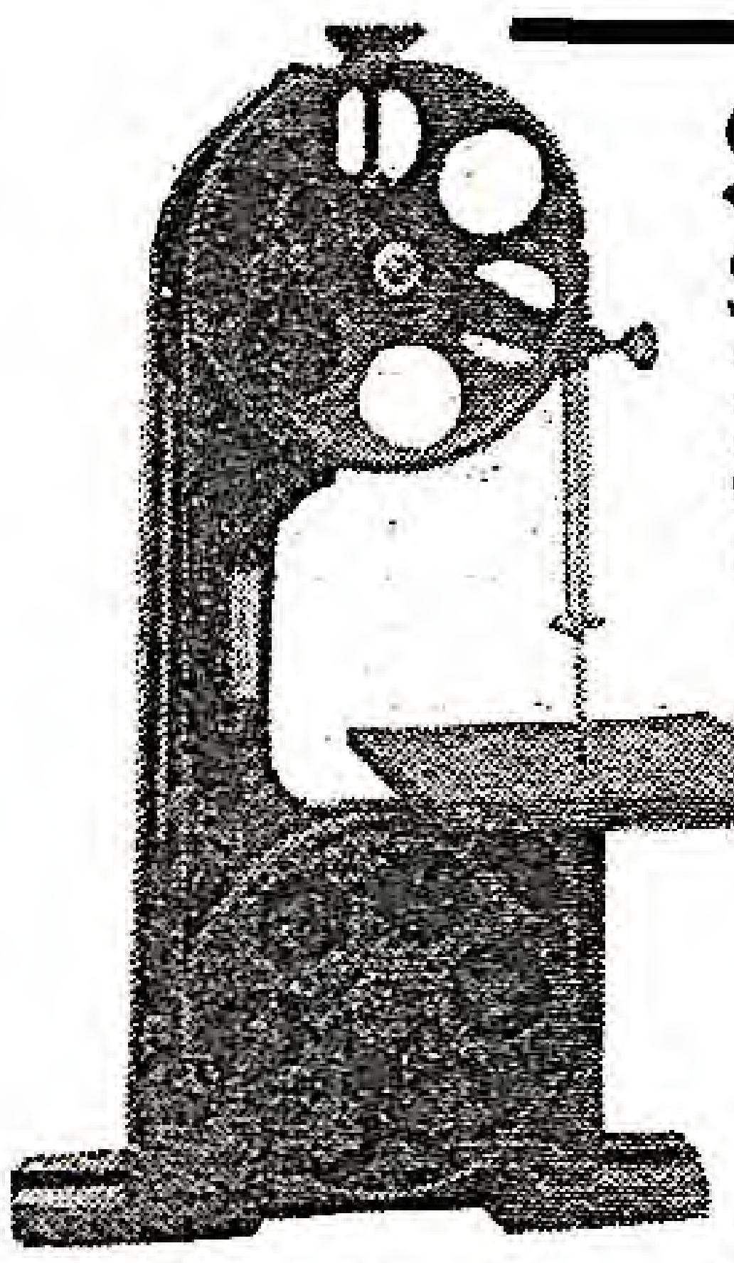

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Attach letter stating age, occupation and name and address of employer and at least one business man as reference.

Is The Dirigible Doomed? — Yes

[*Continued from page* 127]

stresses and strains that no metal within given weight limits can stand.

Many of the world's leading military and naval authorities are also convinced the dirigible is too easy a target and too vulnerable for any practical military use. One would have a jolly time gathering up the pieces of any dirigible that is ever fired upon by a modern anti-aircraft battery.

After a series of disastrous experiences with dirigibles England abandoned them several years ago in favor of aeroplanes for both military and commercial purposes. Italy soured upon the dirigible when Signor Umberto Nobile executed his infamous but tragic comedy of errors in the Arctic with the airship *Italia* during the summer of 1928. France's faith in the dirigible went down the chute with the loss of the *Dixmude*. No doubt the crashes of the Akron and Macon will settle the hash of the dirigible in America. Germany is the only nation still attempting to carry on —trembling in her boots for fear of what may happen any day to the *Graf Zeppelin*, an old bag of hydrogen, the dying hope of lighter-than-air enthusiasm.

Needed Electrical Inventions

[*Continued from page* 85]

would sell like the proverbial hot cakes. It should be small, light and driven by a fractional horsepower motor. It should wash and dry as it progresses over the surface of the window using very little water to be carried in a small reservoir. A successful design for such a device should be worth considerable.

The world needs a new form of electrical heating pad and needs it badly. The present heating pad is delicate and fragile and open circuits develop very easily if the pad is not handled correctly. For instance, it is impossible to fold heating pads; yet when people lie on them for treatment of back ailments, they are apt to break.

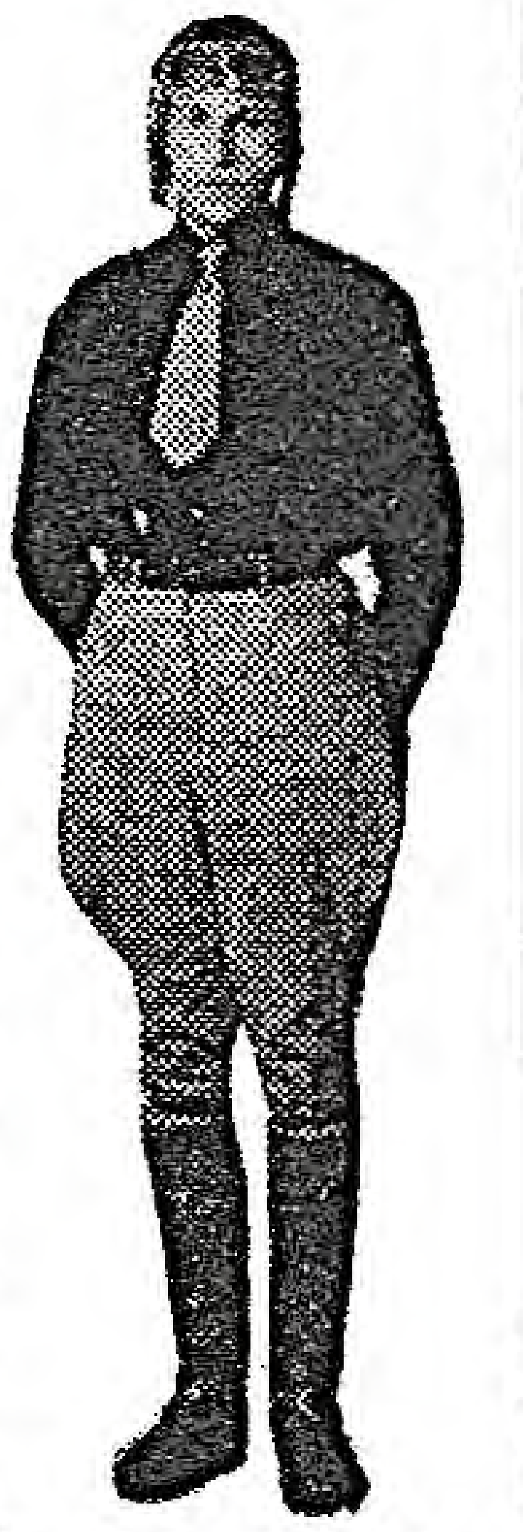
We already have toasters that automatically eject the toast when it is finished. What is needed now is a waffle iron that will do the same thing.

Electric fuses that will automatically eject themselves after they have blown would also be a big help to the electrical industry. In the household they would not only indicate the place where the fuse had failed but they would also reduce the possibility of shock.

A window in a storage battery so that the water level could be seen without removing the filling plugs would be a big money maker.

An attachment for an ordinary tubular flashlight so that it can be made to project magic lantern slides or films would be very popular. Manufacturers producing flashlight batteries would be very much interested in it.

You're Way AHEAD in AVIATION



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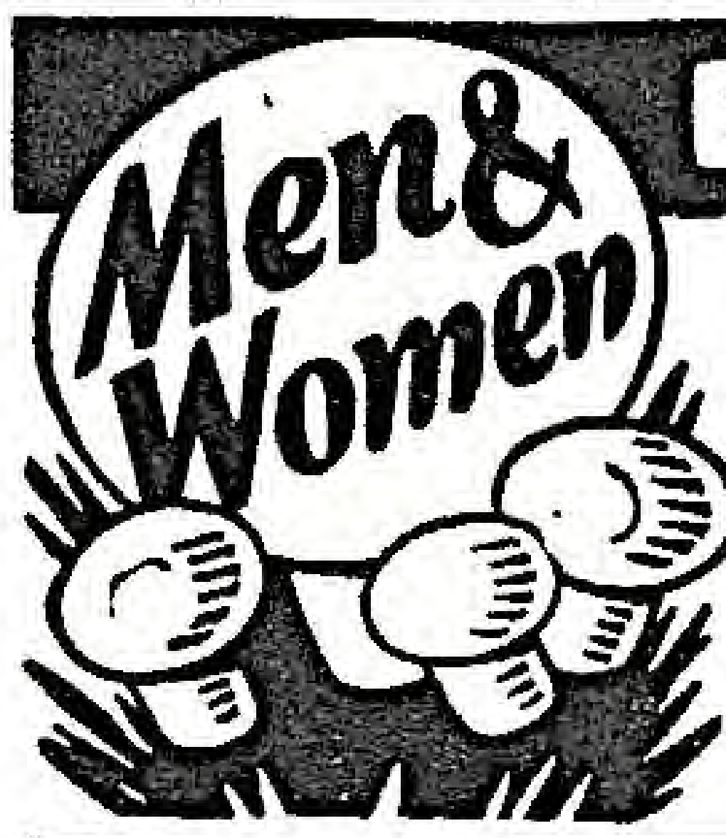

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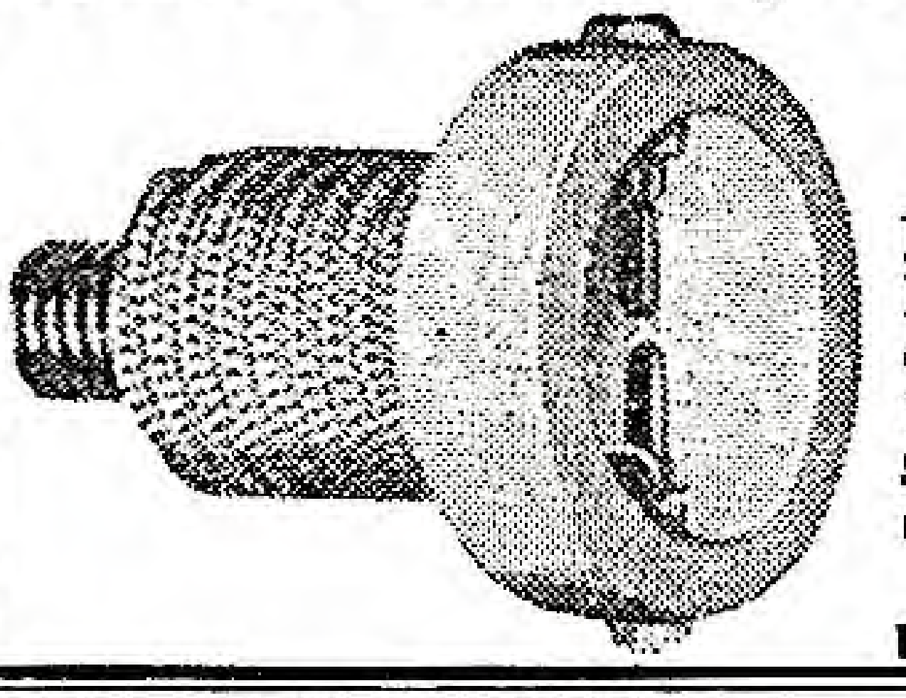

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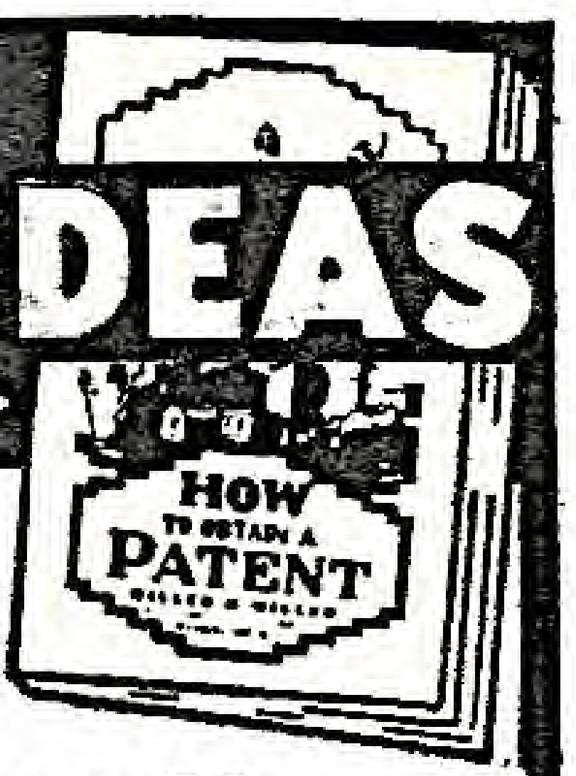
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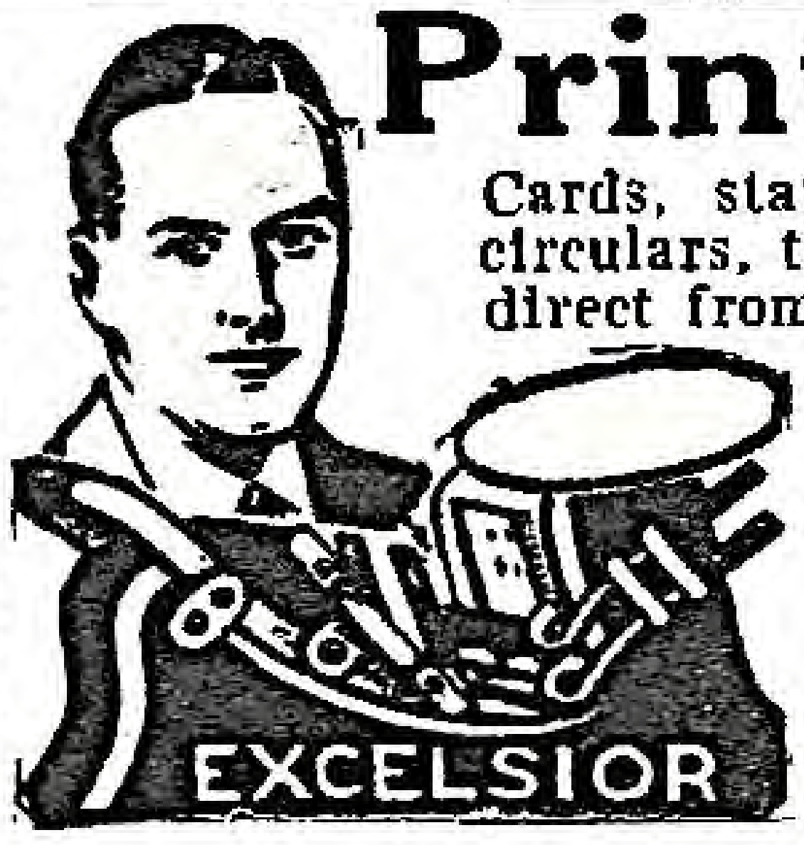

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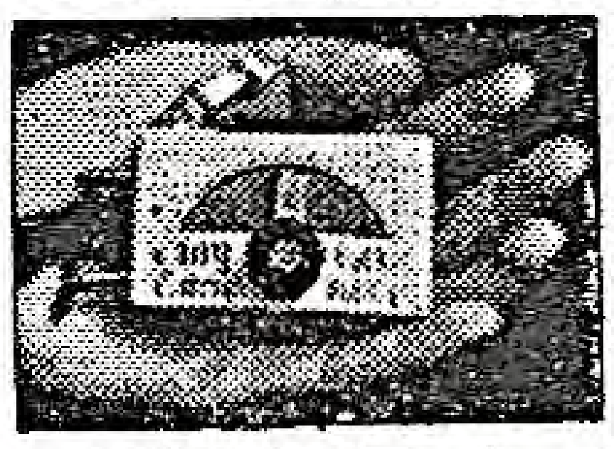

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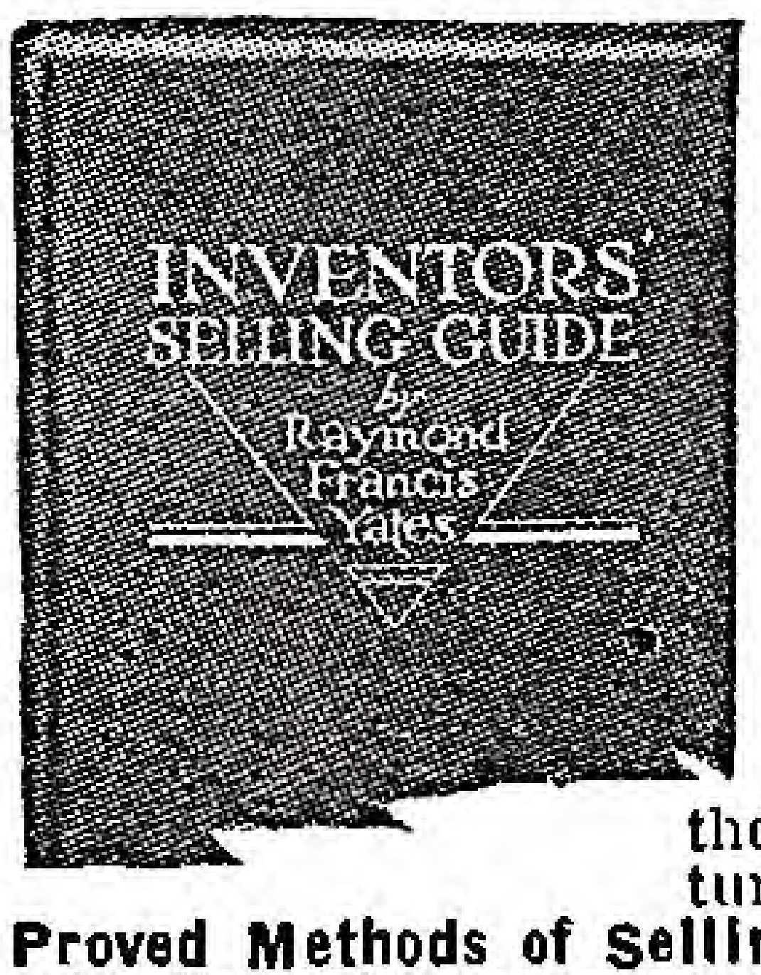

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HAND MACHINE and 5¢ TIRE MAKES $2.00 MAT

Brand new. Fully patented. Few men already started report unprecedented success. Wm. Eagle writes, "Can't make mats fast enough. First week brought over 200 orders for $1.00 to $10.00 each." Flash from Harris says: "Orders enough to keep 15 men busy all the time." Gunter got big order from County Commissioners and now reports: "Just signed up order for all Grade Schools and High Schools." No wonder responsible men are throwing everything else aside to establish local FABRIX factories.

COSTS NOTHING to get complete facts. Just send name and address. We'll send description of simple hand machine that quickly slices old tire into strips; show you how patented method forms strips into thick, springy, long-wearing FABRIX Mats—how five cents worth of Junk Tires makes a $2.00 Mat; how you can start on a reasonable investment and build a business so big, so fast, that it will take your breath away. Don't delay a minute. Write or wire today. All information is free.

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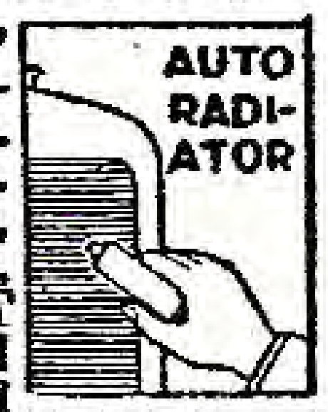

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Meet The Dispatcher

[*Continued from page* 118]

have a clear shot to the point of derailment. It costs the company—so the management figures—five hundred dollars per hour to have the main line blocked and out of commission. He grabs a few moments to notify the proper officials of the accident — superintendent, trainmaster, roadmaster, wrecking foreman. He orders the operator to call the section men if they are not already on duty to get them doing what they can toward having things ready when the "big-hook" arrives. There must be no delay—

The road will be seething with trains when the track is clear again. He wants to keep ahead of the game if possible. He begins to move trains up a notch or two so they will be closer to the cleared point and thus save time. An hour later the trains are moving again, and the dispatcher turns once more to his routine —the exciting routine which means safety to his railroad.

Uncle Sam Trains Fighting Experts

[*Continued from page* 53]

of instruction in the country in scientific weather forecasting.

With rapid mechanization of the Army taking place, several hundred competent auto mechanics are graduated every year from the Quartermaster Motor Transport School at Camp Holabird, Maryland.

The Army maintains in each Corps Area a school for cooks and bakers. At Washington, D. C., is the Army Veterinary School, which turns out expert meat inspectors as well as men trained as veterinarians. Business and clerical courses are taught in the Finance School at Washington and in the Quartermaster School at Philadelphia. The Coast Artillery Corps trains men to handle the big guns at Fort Monroe, Virginia.

The Navy has schools at Hampton Roads, Virginia, and at San Diego, California, where naval mechanics begin their careers. In other schools Navy recruits receive training as electricians, carpenters, and a host of other trades.

In the Army candidates for various schools are selected by commanding officers from those who volunteer. The Signal Corps, Quartermaster Corps and Engineers are the best bets for those who want to learn a trade. With 55 trades being taught in the Navy, all men have an equal opportunity to learn a trade during their four-year enlistment. Recruits enlist for general service, and are sent to the training station at either San Diego or Hampton Roads. They spend three months learning seamanship, drill, and other things that all sailors must know.

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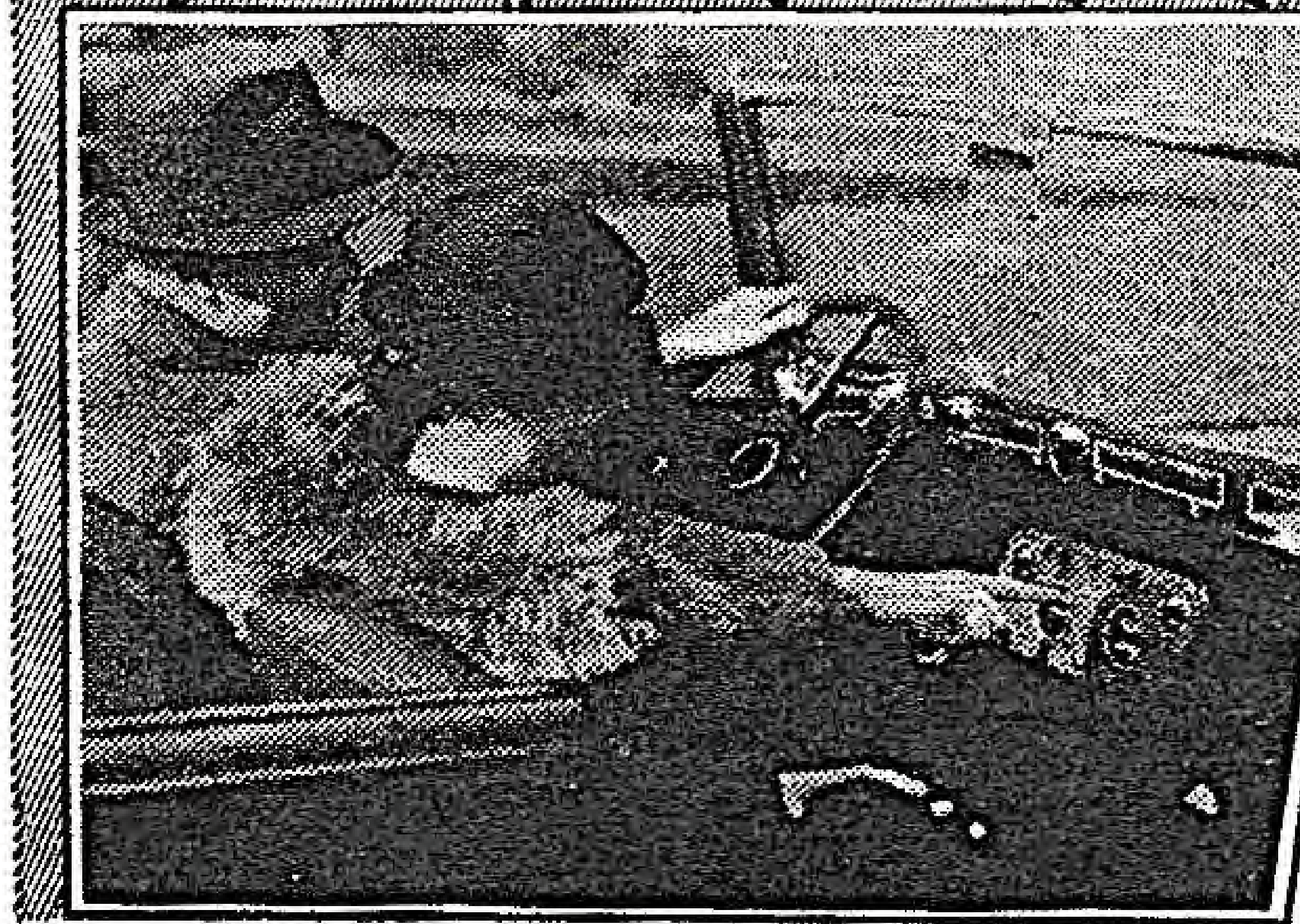

Saves up to Thirty Per Cent On Gas. Provides Faster Pick-Up---More Power---Greater Mileage and Smoother Running.

GET FREE INFORMATION

CHRYSLER
Have tried the Vacu-matic and it sure is fine. Better pick-up with a 30% gas saving.—John C. Martin, Pa.

PLYMOUTH
I am amazed at Vacu-matic performance. It's giving me 5 more miles per gallon. - Walter Zielinski, Ill.

V-8 FORD
I installed both Vacu-matics and they work excellent. On my own V8 Ford I notice wonderful performance in pickup, get-away and gas saving. — Burt Burnett, Mich.

BUICK
Everything you claim about Vacu matic is true. I now get 20 miles to the gallon. Before I was only averaging 15½ miles. — C. Constantino, Fla.

FRANKLIN
With Vacu-matic I have increased my mileage from 10.1 to 14.2 miles per gallon. I figure I save over $75.00 a year in gasoline. R. K. Radtke. Wis.

SAVES $180 A YEAR
On my Plymouth 6 I obtained an average of 22 miles per gallon, an increase of 7 miles. This means a saving of $15 a month or $180 a year. F S. Peck, Calif.

CHEVROLET
Please send me a Vacu-matic for a Model A. The mileage on my 1933 Chevrolet jumped from 18 to 22 miles per gal. with Vacu-matic. — Paul P Haas, Mass.

ALL WELL PLEASZD
Enclosed find order for 12 more. Everyone I have sold is giving from 4 to 6 more miles per gallon. I have 3 more orders for V8 Ford. Everybody is well pleased.—J. O. Carll, Texas.

MODEL A FORD
Have been using the Vacu-matic for a month. I used to get 20 to 22 miles per gal. Now I get 30 to 33 miles. It is amazing the difference it makes.—James W. Barr, Canada.

NASH
On my Advanced 6 Nash gained 17½% in mileage. The car will idle down to 3 miles an hour and then take gas without a complaint. — J. Showalter, Mo.

DODGE
Just completed 2310 miles on 92 gallons in my 1933 Dodge 6. This figures 25 miles while before I averaged only 20 miles per gal. on trips. — Al Fruzyna, Calif.

OLDSMOBILE
I am well pleased with Vacu-matic on our Oldsmobile. A test proved it to give 18 miles per gal. Before we considered 13 good. — Arthur Williams, N. Y.

Above are just a few of the many unsolicited letters received from Vacu-matic users.

VACU-MATIC

PATENT PENDING

the Carburetor Control that "BREATHES"

AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, greater speed and smoother running

New- *Automatic*- Nothing Like It!

The self-starter—four wheel brakes—knee action—streamlining . . . and now VACU-MATIC! The greatest motor improvement of recent years! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds. Vacu-matic is *entirely different!* It is AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. Just put it on and forget it! Sharply cuts fuel wastes, saves dollars in gas costs, reduces carbon and gives your engine new pep, greater power and longer life.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and welded into one unit, correctly adjusted and *sealed at the factory*. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

Agents and Salesmen

If you are interested in earning unusual profits, check coupon. Exclusive territories are now being granted.

The VACU-MATIC Co., Wauwatosa, Wis.

Guaranteed Gas Savings

The VACU-MATIC proves itself on every car. It is guaranteed to give worth-while gas savings, quicker pick-up, and more power or it costs you nothing. "On a test I gained an average of 4 miles on a gallon," writes Alex Wertz. "Vacu-matic is the best I have ever tried." Clarence Rutzin—"I have tried the Vacu-matic on several tests and find that I get between 5 and 6 miles per gallon increase, have more mileage, have greater pickup."

Free Details

Learn about this remarkable device that so greatly affects the entire performance of your motor. Learn why your car is costing you extra money to operate without VACU-MATIC. See why your VACU-MATIC equipped car will leap away from traffic without sputter or hesitation. Discover a new driving thrill and enjoy the savings. Get the facts! Write today!

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Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

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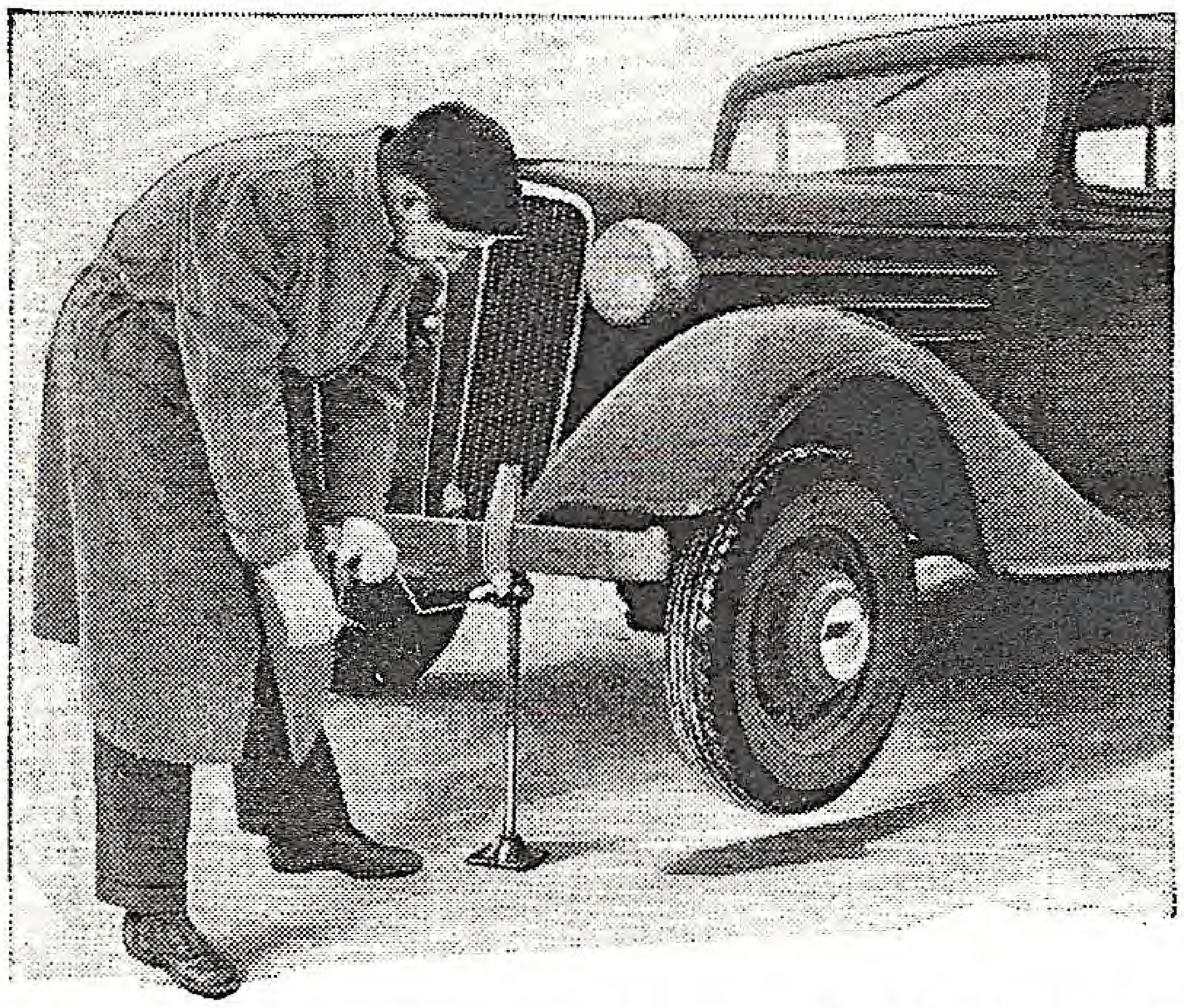


This "standup" jack permits the motorist to lift his car by the back bar of the bumper, without even stooping or soiling his hands. A threaded shaft fits into the removable base and raises the car slowly but safely by crank-spinning.

A new glass for use in welders' helmets prevents molten metal from pitting or adhering to it.

A carborundum lawn mower sharpener, attached to the cross bar of the grass-cutter, hones the blades as the wheels revolve.

Milk in concentrated form is being sold "fresh" daily by one distributor who dilutes it fifty per cent with water and still claims that it compares favorably with freshly-bottled milk.

A handy acetylene torch, equipped with an assortment of tips, is designed for soldering radiator repairing, lead burning, melting, tempering, light brazing and other uses.

An acid-resisting cement, which hardens in a day and a half, is now being manufactured. The cement also will resist oil, heat, water and many solvents.

Fishlines for casting or trolling are offered in lengths containing a different hue for every five yards. The angler determines the distance of his toss by examining the color of the line which remains on his spool. The new line doubtless will prove popular among all fishermen who wish to compare casts.

A telephone lock which prevents outsiders from using a private toll phone was recently invented and installed in a Hollywood theater. Locked in a second, the device saved its owner $40 during the first month that it was placed in use.

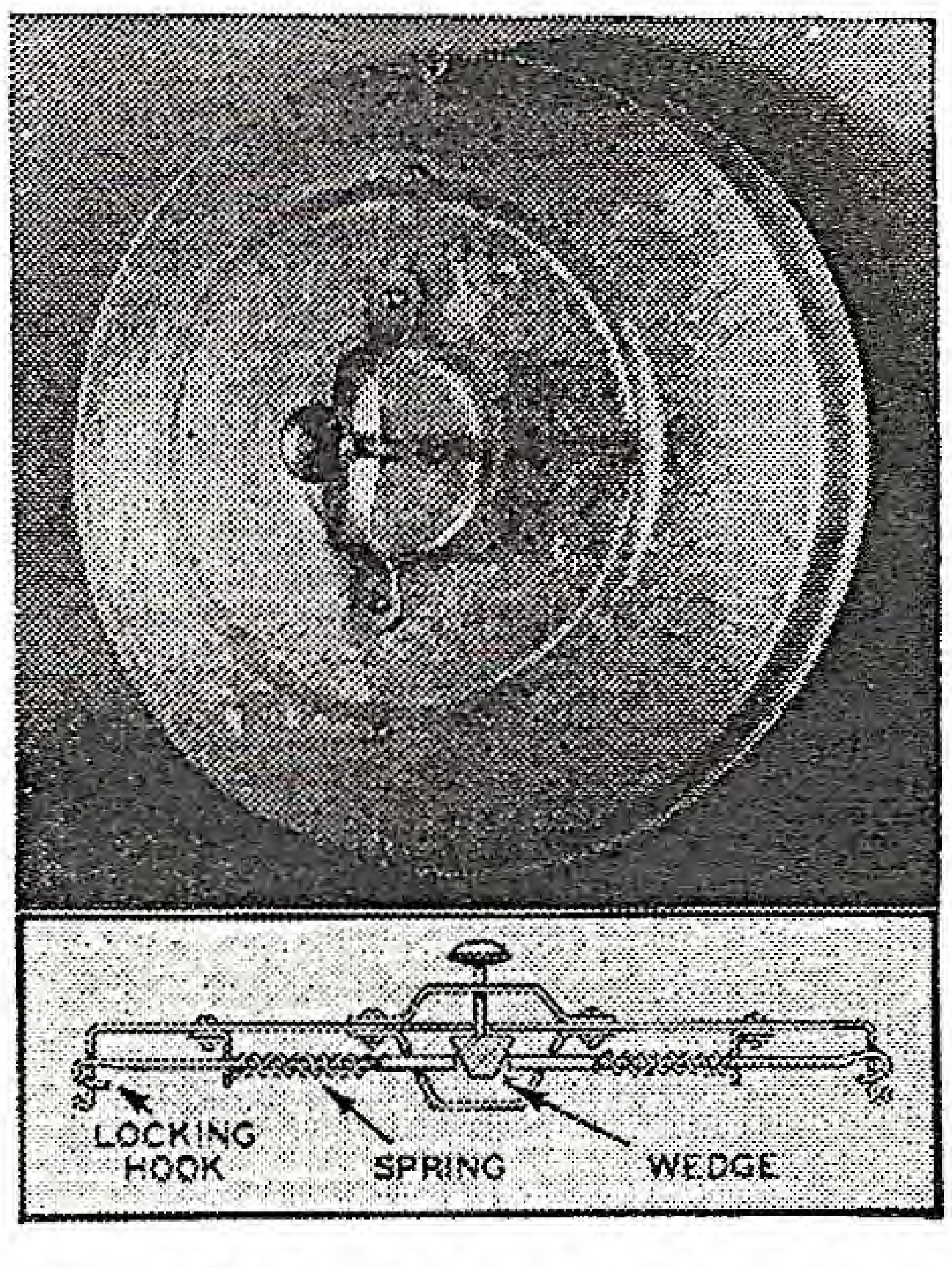
A portable grinder, weighing under two pounds and achieving a rating of 50,000 r. p. m., is now available for milling, circular filing, reaming, routing and carving as well as grinding. Mounted in a drill press, it literally punches out small holes, even using small hair drills. Lubrication is automatic.

A small size fire extinguisher, which carries only two pounds of carbon dioxide, is especially fitted for putting out oil or gasoline fires. It requires charging only after actual use.

New mica transmitting condensers, which are a departure from the conventional pointed-end design, permit perfect stacking in minimum space, offering at the same time any combination of electrical connections.

Acoustic "feed-back" is practically eliminated under increased volume with a new type beam velocity microphone which is claimed to have advantages over the diaphragm model.

A transparent oil- and moisture-resistant wrapping paper, made from crude rubber, is now on the market. It is self-sealing when heated to a temperature of 105 degrees.



A mechanical lid which will not come off and spill garbage can contents has been devised by a Michigan man. Pressure on a plunger rod passing through the handle and cover releases a spring locking hook which grasps the bead.

A new base and cap for use with the new Lumiline lamp makes possible a wide variety of applications in store counter, window display and side wall lighting. Because of its small size, the base permits maximum light to reach the surroundings.

A novel cardboard reflector sign, which can be placed in the window of the home or car, lights from passing or following autos.

Editor's note — Addresses of manufacturers of these and other new products in this issue can be obtained by sending a stamped, self-addressed envelope to Modern Mechanix and Inventions. *Manufacturers are invited to submit photos and literature for this page.*

WHERE ARE YOU .... *Here in the Spotlight or lost among the Crowd?*

PARTIES ARE TWICE AS MUCH FUN WHEN YOU PLAY THE *Harmonica*

● It's almost unbelievable how quickly you become popular once you can play the harmonica. Good harmonica players are always in demand for parties, outings, scout meetings and school Harmonica Bands—sure of a good time wherever they go. Thousands of boys and girls who once sat around at parties and watched others take the spotlight have discovered that the ability to play this fascinating instrument is all that is needed to win the admiration of friends—step out of the "wallflower" class—and know the thrill of being a wonderful entertainer.

Learn In No Time

And don't think there's anything difficult about learning. It's easy. So easy, in fact, that boys and girls say it's FUN. All you need is the new illustrated Instruction Book: "The Art of Playing the Harmonica" that is sent FREE to those mailing the coupon below. With this remarkably simple method of instruction you can become a good Harmonica player in a very short time. Before you know it, you'll be playing the old favorites, the movie and radio song hits and many of the classical numbers. Your friends will marvel at the way you can perform—and you'll begin to know the joys of popularity.

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But, remember, you can't learn to play easily and skillfully with "just any" harmonica. You need one that is true to tone, accurate in pitch, perfect in construction—a Hohner. Hohner Harmonicas are real musical instruments. For 75 years they have been the choice of leading professional players for stage and radio work and recognized everywhere as "the world's best." **Look for the name Hohner on the box and on the instrument. If it's not there, it's not a Hohner.**

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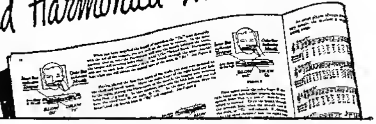
FREE *Illustrated Harmonica Instruction Book*



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Address ....
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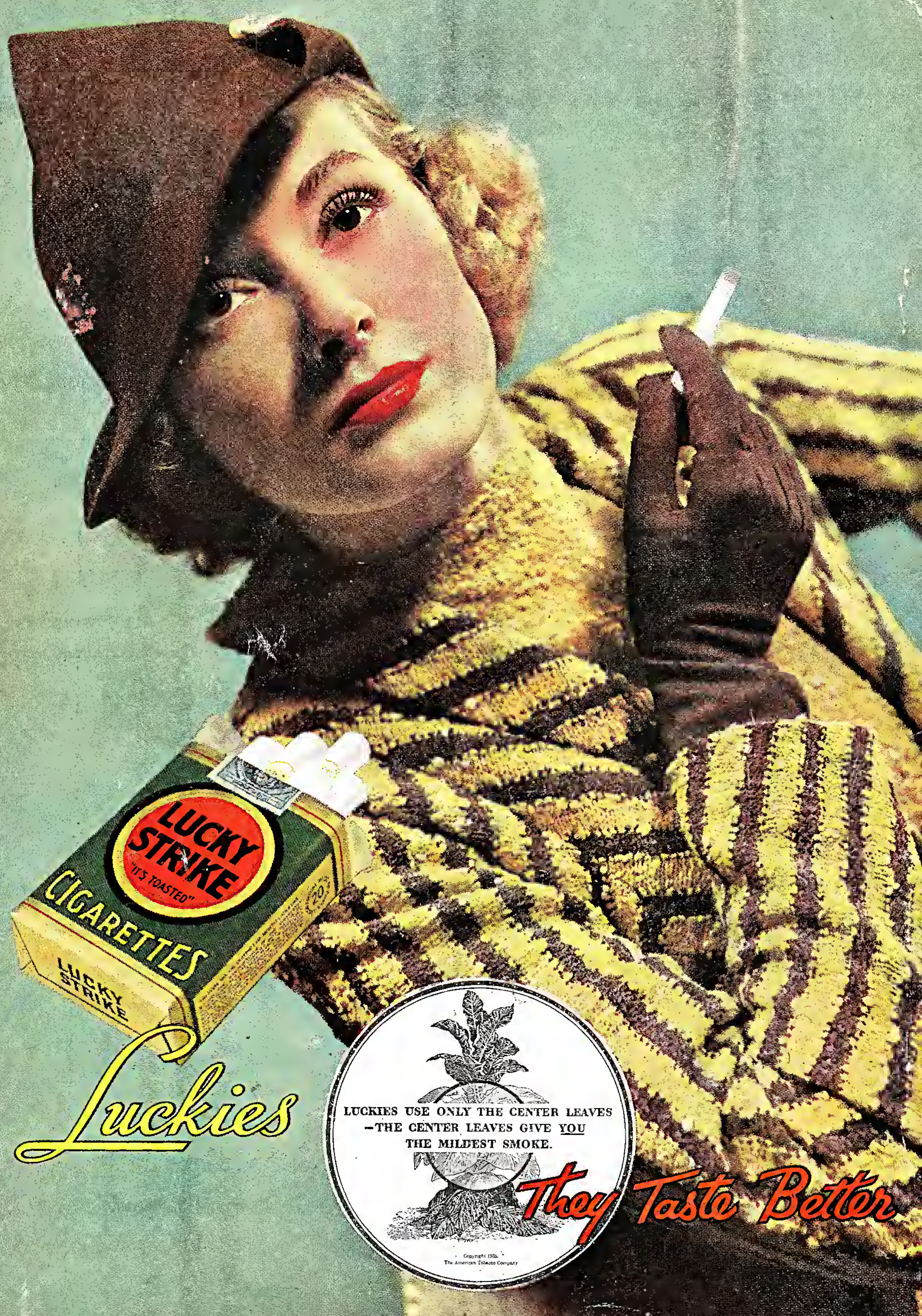
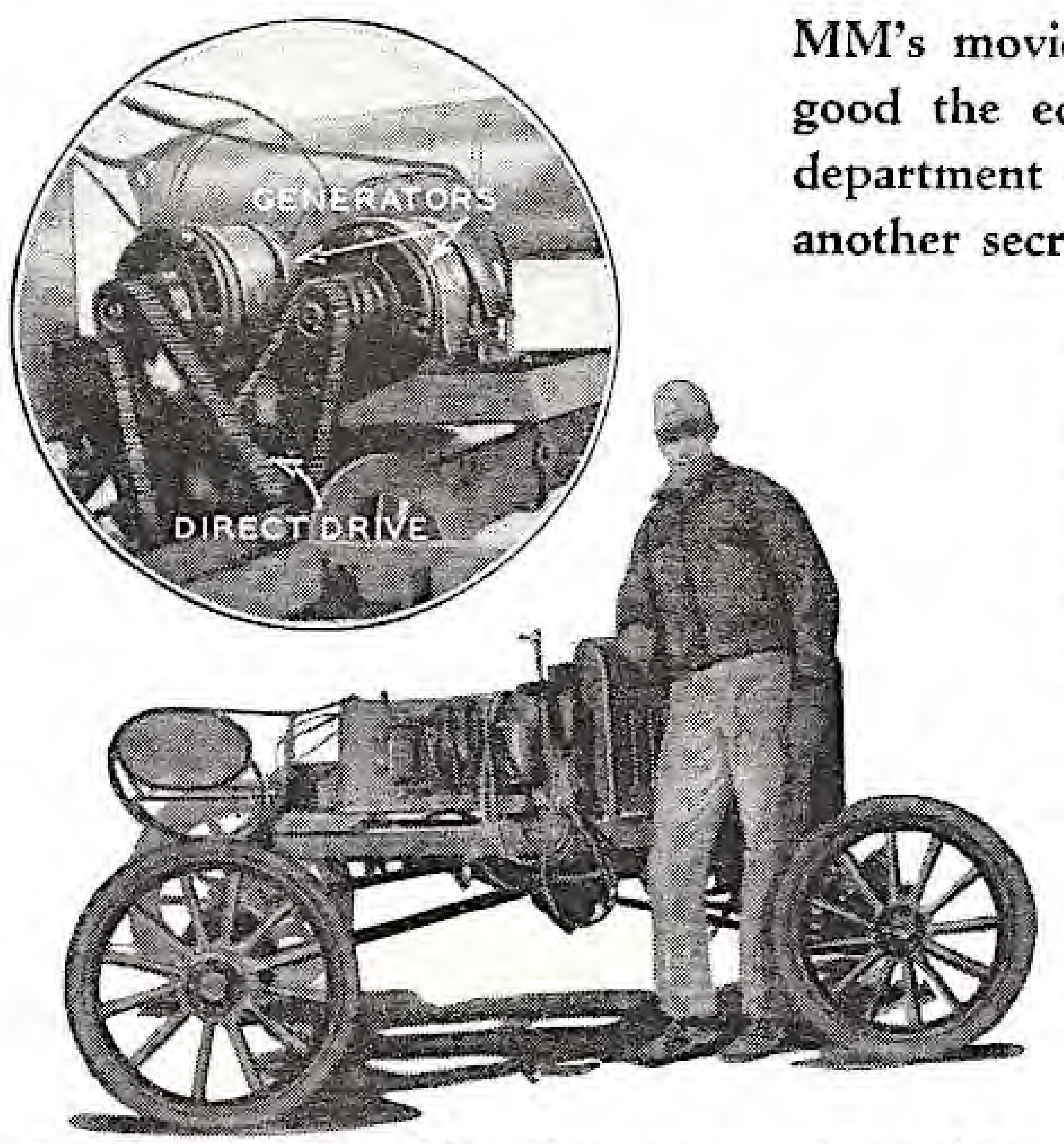

LUCKY STRIKE
"IT'S TOASTED"
CIGARETTES
20
LUCKY STRIKE
Luckies
LUCKIES USE ONLY THE CENTER LEAVES
—THE CENTER LEAVES GIVE YOU
THE MILDEST SMOKE.
They Taste Better

Copyright 1935,
The American Tobacco Company

Random Chips from the Editor's Workbench



Melvin Johnson built two MM welding generators and mounted them on a shortened Ford. He won first prize of $5.00. Upper circle shows the two generators. Photo shows Johnson and welding outfit.

MM's movie star's camping trailer looks so good the editor fears you will pass up his department this month. He lets you in on another secret—a new MM all-purpose boat.

HOW do you like it? "What," you say? Excuse us; we thought you'd know. It's that movie star's trailer we've been raving about. Yes, Sir Guy Standing's collapsible camping trailer on page 94. But before you look it over finish the rest of this department, because, if you ever set eyes on that trailer, you'll run out to order 2x4s, brackets, and pipes for the trailer and forget all about this department.

Before getting off the subject, we'll wager that this trailer will prove the most popular of MM's variety of excellent designs. Aloha, Wanderer, and Bungalow, three of several trailers described in MM's free blueprint catalog, have been going over with a bang, but Sir Guy Standing's trailer will go over like a blast from "Big Bertha."

* * *

Now we'll let you in on another secret. Many of you have been asking for a good all-around boat. Can you imagine a boat that is a row boat, an outboard motor boat, a racing sail boat, and a cruiser—all in one? Sounds a bit fantastic, we admit, and you are probably guessing that it's made of rubber so that it will stretch to suit the various types. Actually it isn't. It is not only practical, but practicable. (Our dictionary tells us that there is a difference.) It was designed by an outstanding naval architect who will tell you how to build it in the June MM. Better ask your magazine dealer now to save a copy for you.

* * *

Melvin Johnson liked the arc welder in the October MM so well that he built two of them. He shortened the chassis of a Ford, disconnected the drive shaft and hooked it up to the two welding generators. The result—an excellent job and first prize of $5.00 in this month's Workbench photo contest. His letter:

Sacred Heart, Minn.

Dear Editor:

I am sending you pictures of the arc welder I made from the October MM. I hooked up two of them on a Ford chassis. I cut off the frame about two feet and welded it together with this welder. I put a Kingston governor on the Ford motor and it works slick.

I can weld anything requiring 160 amperes easy. The plans were easy to follow.

Melvin Johnson.

* * *

One of MM's popular boats, described in "How to Build 20 Boats" and in the blueprint catalog, is the Olympic racing catboat. James Spoor built it, sent us photos, and an interesting long letter. He wins second prize of $3.00 this month. Here's part of his letter:

305 Avenue E, Cloquet, Minn.

Dear Editor:

I am enclosing photos of an Olympic V-bottom racing catboat, as designed by Naval Architect E. B. Shock, which I built from MM plans at a total cost of $70.

It certainly is a swell boat. It's speed is such that motor boats with light motors are even left behind if they attempt to race. The boat was designed for use in light to moderate wind but is also at home in strong wind and rough water.

For the mast I got a fine straight spruce tree a little more than six inches in diameter at the butt and about 40 feet long. From this I cut both the mast and boom. After peeling the tree I worked it down to the required diameter for mast and boom.

James W. Spoor.

Spoor adds that anyone desiring advice on building this boat can write him.

* * *

The model boat shown in the photos is a scale model job of an actual ship. Peter Buss, Jr., had only a photograph to work from, yet did an excellent job. His letter, third prize winner of $2.00, follows:

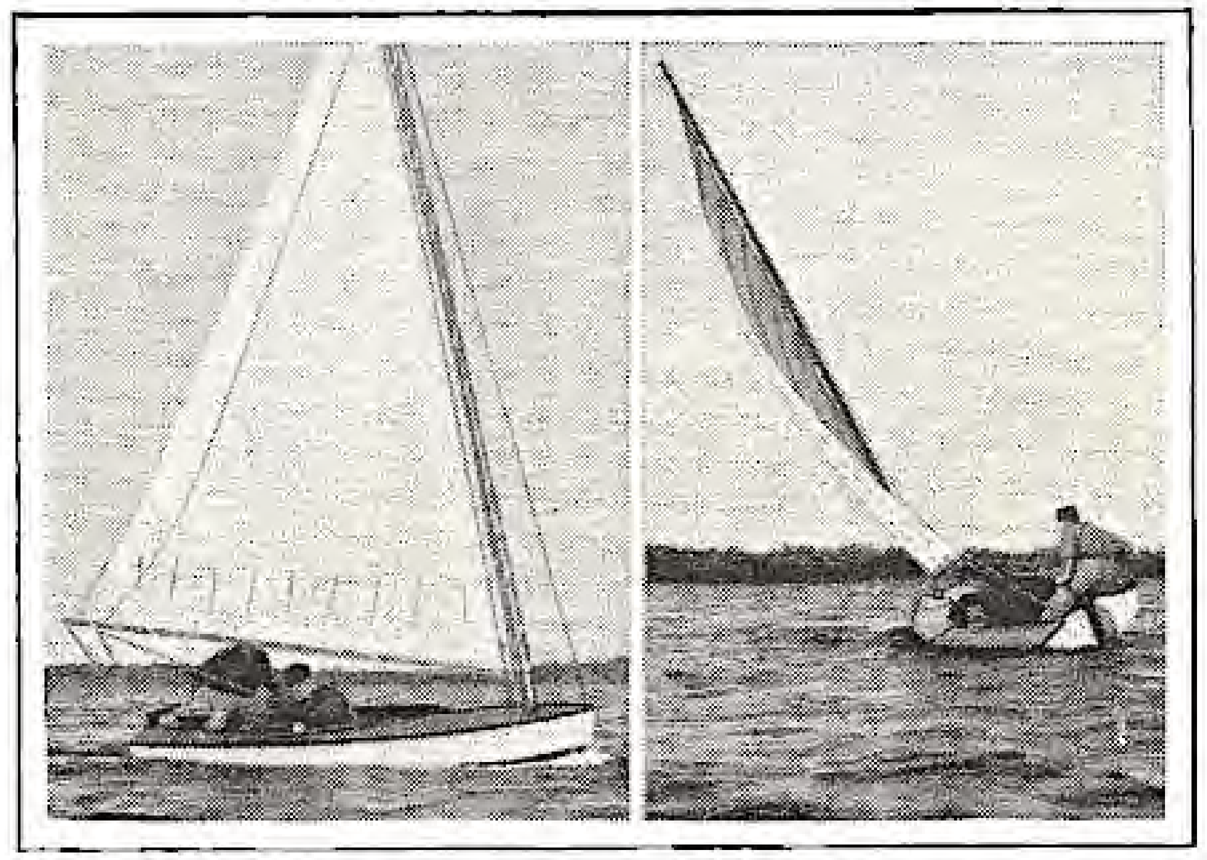
Bethlehem, Pa.

Dear Editor:

This is a model of President Roosevelt's vacation cruise ship of July and August, 1934. It is 97 inches long, 14½ inches wide, 49 inches high, and was completely made by hand from a photograph purchased from a newspaper.

It is complete in all essential details:—two lifeboats, three motor launches, two motor barges, and two seaplanes mounted on runways. It is equipped with 6-volt lights above deck and 110-volt lights below. Its weight is about 45 lbs. It is made of 3-ply veneer wood obtained from radio packing crates.

Peter A. Buss, Jr.



James Spoor is enthusiastic about this MM Olympic catboat he built. These two photos brought him the second prize of $3.00.

Do MM readers like the new roto printing? After the March issue appeared on the stand, we were swamped with letters and cards praising the improved appearance of the magazine. Here are just a few excerpts from many. James P. McCarthy, Franklin, N. M.: **Allow me to congratulate you on the new rotogravure printing which is a great improvement and incidentally the only thing that I see you could improve.** Noal Hatch, Provo, Utah: **I like the new printing and class your magazine as one of the very best on the market.** Evald Johnson, St. Charles, Ill.: **I think the new suit is fine. It is more interesting to read.** Lawrence Landry, Conway, N. H.: **The roto printing is fine. The pictures and subjects show up better.** Ralph Marsh, Bloomingdale, Ohio: **MM looks like a million bucks in its new gown.** Otis G. Feather, Cuzzart, W. Va.: **I think it is a wonderful book. I went 30 miles to get a copy so that I could get the address and become a subscriber.**

[*Continued on page* 24]

PROBAK JUNIOR 4 BLADES for 10¢

PROBAK JUNIOR
MADE IN U.S.A.
T.M. REG. U.S. PAT. OFF.
OTHER PATENTS PENDING

ALSO 10 FOR 25¢
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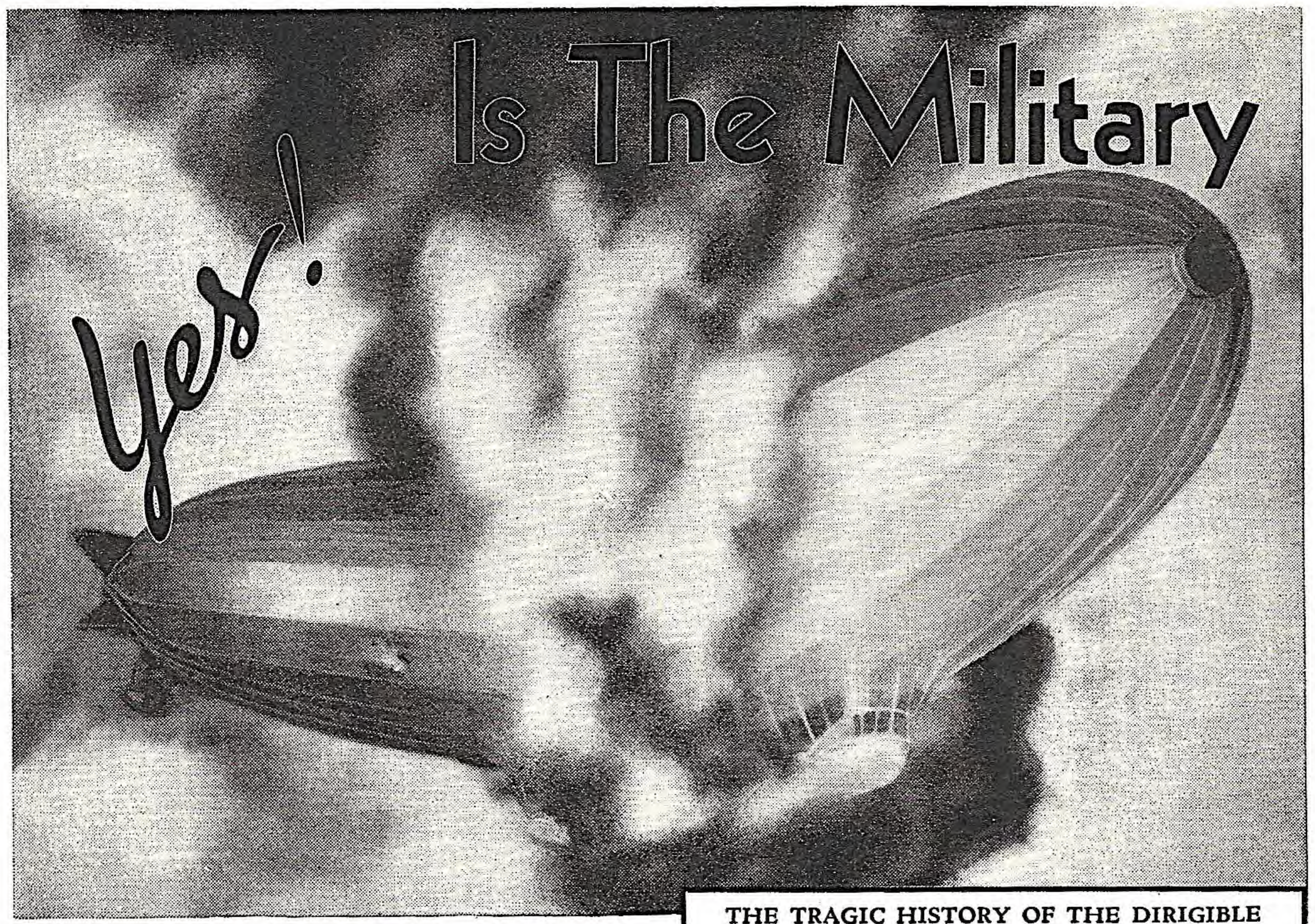
SHAVING COMFORT
—*hits all-time low in price*

● You'll rub your finger-tips across your chin and smile with pleasure after your first shave with Probak Jr. For here's a razor blade that's made for easy work on tough beards — brings true shaving comfort down to the lowest price level. This record-breaking double-edge blade is ground, honed and stropped automatically — assuring unvarying high quality. Save money and shave with ease. Ask your dealer for Probak Jr.

Is The Military Dirigible Doomed?



Wing Commander Uhler claims the dirigible is doomed because with hydrogen gas it is a fire hazard. Helium, he says, is not as buoyant, requires larger, dangerous structures.

by
WING COMMANDER S. K. UHLER
Royal Air Force, Great Britain, Retired

Editor's Note: The views and opinions expressed in this article are those of the author and do not necessarily reflect the official views or opinions of the armed forces of His Majesty, the King of England.

SINCE Count Zeppelin built and flew the first large, rigid airship, approximately 150 such lighter-than-air craft have been built and flown. Practically all of them, built by Germany, Great Britain, France and America have exploded in mid-air, burned or crashed with disastrous loss of life. There have been 19 major, peacetime dirigible disasters during the past 23 years. These crashes have wasted 350 lives and a sum of money roughly twenty million pounds ($100,000,000). It would seem the time has come to admit the dirigible a failure, a plaything of the winds and a potential flying mausoleum.

THE TRAGIC HISTORY OF THE DIRIGIBLE

In the last 23 years there have been 19 dirigible disasters with a loss of 350 lives. The destruction of four dirigibles, the Shenandoah, the ZR-2, the Akron, and the Macon, cost the United States a total of $10,825,000 for construction costs alone.

The record of disasters:

Feb. 12, 1935—U. S. Navy dirigible Macon crashed into the Pacific. Two killed.

April 4, 1933—U. S. Akron crashed off New Jersey coast. 73 dead.

Oct. 4, 1930—British R-101 exploded over France. 46 dead.

May 25, 1928—Italian Italia crashed near North Pole. Eight dead.

Sept. 3, 1925—U. S. Shenandoah wrecked in storm over Ohio. 14 killed.

Dec. 21, 1923—French Dixmude crashed into Mediterranean. 52 killed.

Feb. 21, 1922—U. S. Roma burned in flight near Hampton Roads. 34 dead.

Aug. 24, 1921—ZR-2 built in England for U. S., collapsed over Humber River. 42 killed.

Jan. 29, 1921—British R-34 wrecked at Howden, England. No casualties.

July 21, 1919—Dirigible burned over Chicago. 10 killed.

July 5, 1919—British NS-11 destroyed over North Sea. 12 dead.

June 20, 1914—Airship and airplane collided at Vienna. 9 killed.

Sept. 9, 1913—German Zeppelin L-1 destroyed off Heligoland. 15 dead.

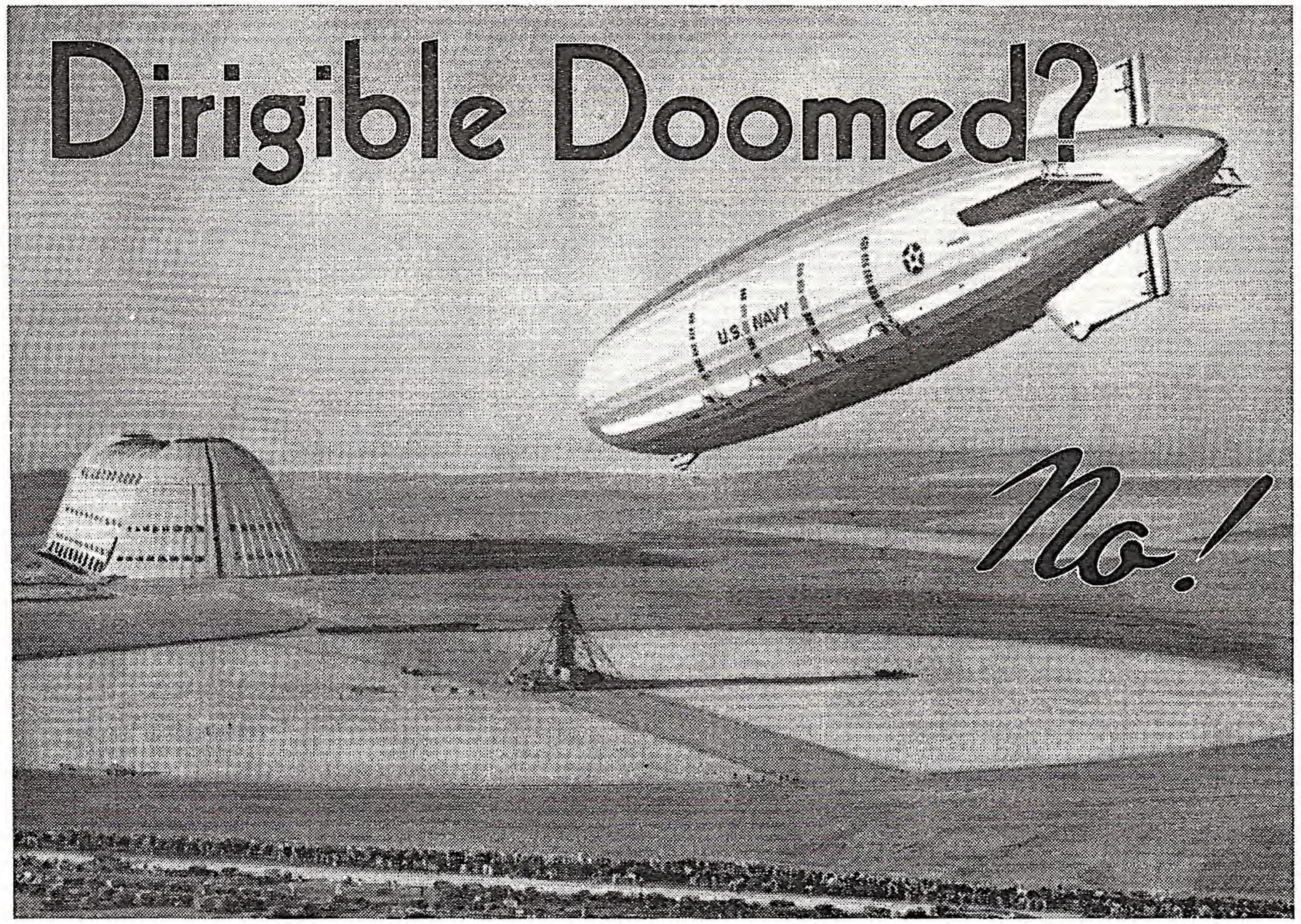
Oct. 17, 1913—Zeppelin L-2 exploded over Johannisthal. 28 killed.

July 2, 1912—Balloon Akron exploded at Atlantic City. 5 dead.

Four other peace-time Zeppelins were lost in accidents.

The writer would like to have seen lighter-than-air aviation succeed. I had high hope for it some years ago even when it seemed that every great airship was foredoomed to destruction. My hope rose to new levels when the discovery of helium promised to produce dirigibles free from the perils of fire and explosion. Unfortunately, however, the use of helium has not justified the predictions of lighter-than-air enthusiasts. My hope for ultimate success in lighter-than-air craft has

[*Continued on page* 127]



The Macon preparing to land at the hangar at Sunnyvale. Destruction of this ship in the Pacific near San Francisco has renewed debate over the value of lighter-than-air craft.

by LIEUTENANT JOHN E. HOGG
U. S. Naval Reserve

Editor's Note: The views and opinions expressed in this article are those of the author and should not be construed as reflecting the official views or opinions of the United States Navy Department.

SOME years ago an American by the name of Holland invented the submarine. The United States recognized its military possibilities but developed a bad case of cold feet after several of Mr. Holland's early, experimental craft submerged permanently. So, we abandoned the submarine, let Germany pioneer the thing, and use it against us to our untold disadvantage in the World War.

As if we had learned nothing by that blunder the future of lighter-than-air craft development now hangs in the balance insofar as the United States is concerned. Because three of the four helium airships we have owned and operated have crashed from structural failures, a considerable demand has arisen that we spend no more money and risk no more lives in the attempted development of a type of aircraft now termed by many—a demonstrated impracticability.

REMARKABLE RECORD OF THE GRAF ZEPPELIN

Under the command of Dr. Hugo Eckener the Graf Zeppelin is in its seventh season of trans-ocean commercial flying this year. It has made 60 crossings of the South Atlantic, seven of the North Atlantic, and one of the Pacific.

The Graf Zeppelin has flown 1,025,271 miles. In 1929 it flew 21,700 miles around the world with 20 passengers in 20 days, 4 hours.

This summer Germany's new dirigible, the LZ-129, the world's largest, will make its maiden flight. Capable of carrying 50 passengers, it may fly the Atlantic to the United States.

If the mob psychology bred of the Shenandoah, Akron, and Macon disasters leads us to abandon further dirigible development, even temporarily, the results may be far-reaching and inimical to our national hopes and ambitions. We may repeat our mistake with the submarine. Some more far-seeing and less-easily-discouraged nation will undoubtedly carry on from the point where we leave off. To that nation we may surrender future naval supremacy and commercial advantages of incalculable value.

The history of dirigible pioneering has admittedly been disastrous, but there is nothing in it to indicate that successful lighter-than-air craft are impossible of attainment. The use of hydrogen, an explosive gas, as the agent of aerial buoyancy has been responsible for the loss of most of the dirigibles built prior to

[*Continued on page* 127]

DOES GRASS HOLD Secret of Hidden Power?

by Charles F. Kettering

VICE PRESIDENT, GENERAL MOTORS CORPORATION
GENERAL DIRECTOR, RESEARCH DIVISION

as reported by **PAUL WEBER**

YOU want me to say something about research . . .?

Well, before we set out on any such discussion as that, we should have a pretty fair idea what research is. There is a great deal of misconception about the term. People think research is something mysterious, something romantic. They are fooled by the array of test tubes and complicated apparatus they see in a laboratory. They speak of research as something in a class with sorcery.

Nothing could be further from the truth. There is nothing mysterious about research. It is not romantic in the popular sense of the word. The fact is, there's not much difference between a laboratory and a blacksmith shop. The retorts and apparatus of the laboratory are just our anvils on which we shape new ideas into useful things. The word "laboratory" simply means "workshop."

Research, properly understood is not a profession. It is not just a business. It is not a form of magic.

It is a state of mind.

Left—An informal picture of Kettering at his desk in General Motors Research Laboratories. To him come the problems of the auto industry to be solved by research.

"BOSS KET"

Charles F. Kettering, known as "Boss Ket" to his fellow workers, is chiefly interested in finding the answers to unanswered questions. Two of the foremost that have puzzled him are: "Why is grass green?" and "Why can we see through a pane of glass?"

Head of the General Motors Research Corporation, "Boss Ket" devotes practically all his time to research, to discovering how it can be done when experts and formulas say "It can't be done."

He was born on a farm near Londonville, Ohio, in 1876, educated in a country district school, and was graduated from Ohio State Engineering School in 1904. That same year he revolutionized cash register manufacturing by developing an electric motor to run cash registers. In 1912 he revolutionized the automobile industry and made driving a pleasure by perfecting the self-starter motor and modern lighting and ignition systems.

I often define research by saying:

Research is trying to find out what you are going to do when you can't do what you are doing now. Research is that habit of thought which causes a man to question established ideas, to preserve an open mind toward new ideas, and to strike out on new and untried paths in persistent search of definite practical objectives, calculated to improve upon natural resources to the general gain of mankind.

Now, all that sounds very complicated and obscure. Let's see if we can put the idea into simpler terms by quoting an example of true research—the career of John W. Hyatt.

John Hyatt was a man who perceived that the world was in need of something. He was not interested in any of the world's great theoretical needs. No, the thing he was interested in was a very humble and compara-

WHY IS GRASS GREEN?

"When men can answer that question thoroughly," says Mr. Kettering in the accompanying article, "they may have achieved something as important as the discovery of fire. For that question involves the whole vast mystery of how nature turns sunlight into energy."

Mr. Kettering gave $577,000 to Antioch college to find the answer to this question, which has been troubling him since his farm boyhood. Dr. P. W. K. Rothemund of Antioch is nearing the solution, having discovered that a colorless substance in plants is converted into chlorophyll, a green substance, when it comes in contact with carbon dioxide.

When the vibrations of traffic near the General Motors laboratories upset delicate instruments during an experiment, Kettering erected a tent on Bell Isle, Detroit's island park. He is shown at the right continuing his experiment.

Cadillac Upset Motor Industry in 1912 With Kettering's Self-Starter

Back in 1912 Kettering with the aid of his assistants perfected the first self-starting system as a feature of that year's Cadillac. The self-starter later became known as the Delco. He is shown above at the wheel of a car equipped with the new invention.

tively unimportant necessity — an artificial billiard ball.

At that time billiard balls were made of real ivory, and this was costly. No material had ever been found which would give the same results as natural ivory, at a cost within the reach of thousands of people who wanted cheap billiard balls. Mr. Hyatt entered a contest for a prize offered for a good artificial ivory.

His quest for artificial ivory led him into a study of the rolling and bouncing qualities of balls made of various materials. One time he was called upon to make repairs on a machine for crushing sugar cane. And from his study of billiard balls and his work on the machine, he hit upon the idea which later was developed into the Hyatt roller bearing.

When he had invented the roller bearing, he returned to his original quest. Again, he sought an artificial ivory. And soon he stumbled upon a substance which he developed into celluloid.

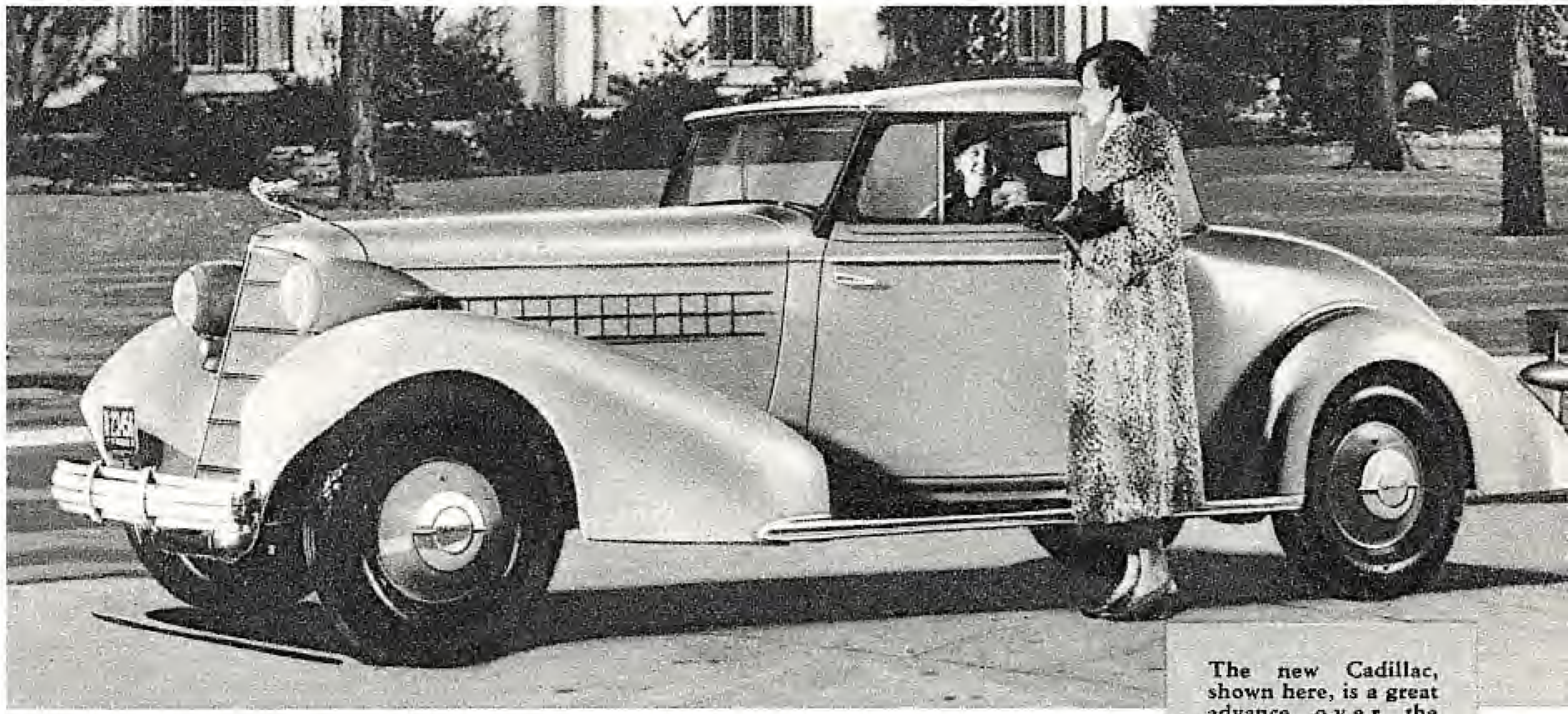
He went further and invented a new type of camera film. Minor achievements followed along the way, but still Hyatt refused to be turned aside from his first objective—an artificial ivory billiard ball.

Year after year he worked. Finally, toward the close of his life he found the right material.

In his quest for this comparatively trivial improvement upon nature, John Hyatt had given life to new industries employing thousands of workers, and had invented new products of real importance to the world.

The story of John W. Hyatt exemplifies the

Strong Arms Had to Crank Old Autos; Today a Button Starts a Car



The new Cadillac, shown here, is a great advance over the early model car on the opposite page. The modern car starts by merely pressing a button with the hand or foot, making driving a pleasure for women as well as men in good or bad weather.

chief characteristics of true research. First of all, research is always open-minded. It forces ideas to stand upon their own feet. It refuses to accept established ideas on the sole grounds that they are established. And it likewise refuses to condemn new ideas simply because they are new. It insists upon valuing all ideas at their intrinsic worth.

When Hyatt began his life-long adventure in research the idea prevailed that only ivory could be used for billiard balls. But Hyatt refused to honor this belief merely because of its venerable age. This "open-mindedness" is identical with what is sometimes called the "scientific spirit." It is the spirit in which all progress, from the beginning of the world, has been made.

Industrial research must also be practical. It can not be isolated from life. When you strike out in search of some improvement upon nature, you must be sure that it is an improvement which somebody will want.

Millions of dollars have been wasted developing doomed ideas because their originators failed to consider the wants and needs of the other human beings who were to use their products. For example, a few years ago, America had a rash of "cycle cars." A little group of automobile men jumped at the conclusion that because small, inexpensive, low-powered automobiles were popular in some parts of Europe, they would be welcome in the United States. They set out to revolutionize the automobile industry. And they failed.

If they had stopped to ask themselves "Who will want this kind of car?" they would never have made their venture. The truth is that very few people could be persuaded to buy the midget cars. The public did not want economy at the sacrifice of power, beauty, strength and the capacity to travel long dis-

---

What is Research?

"Research is a state of mind," declares Mr. Kettering. "Research is trying to find out what you are going to do when you can't do what you are doing now. Research is that habit of thought which causes a man to question established ideas, to preserve an open mind toward new ideas, and to strike out on new and untried paths in persistent search of definite practical objectives, calculated to improve upon natural resources to the general gain of mankind."

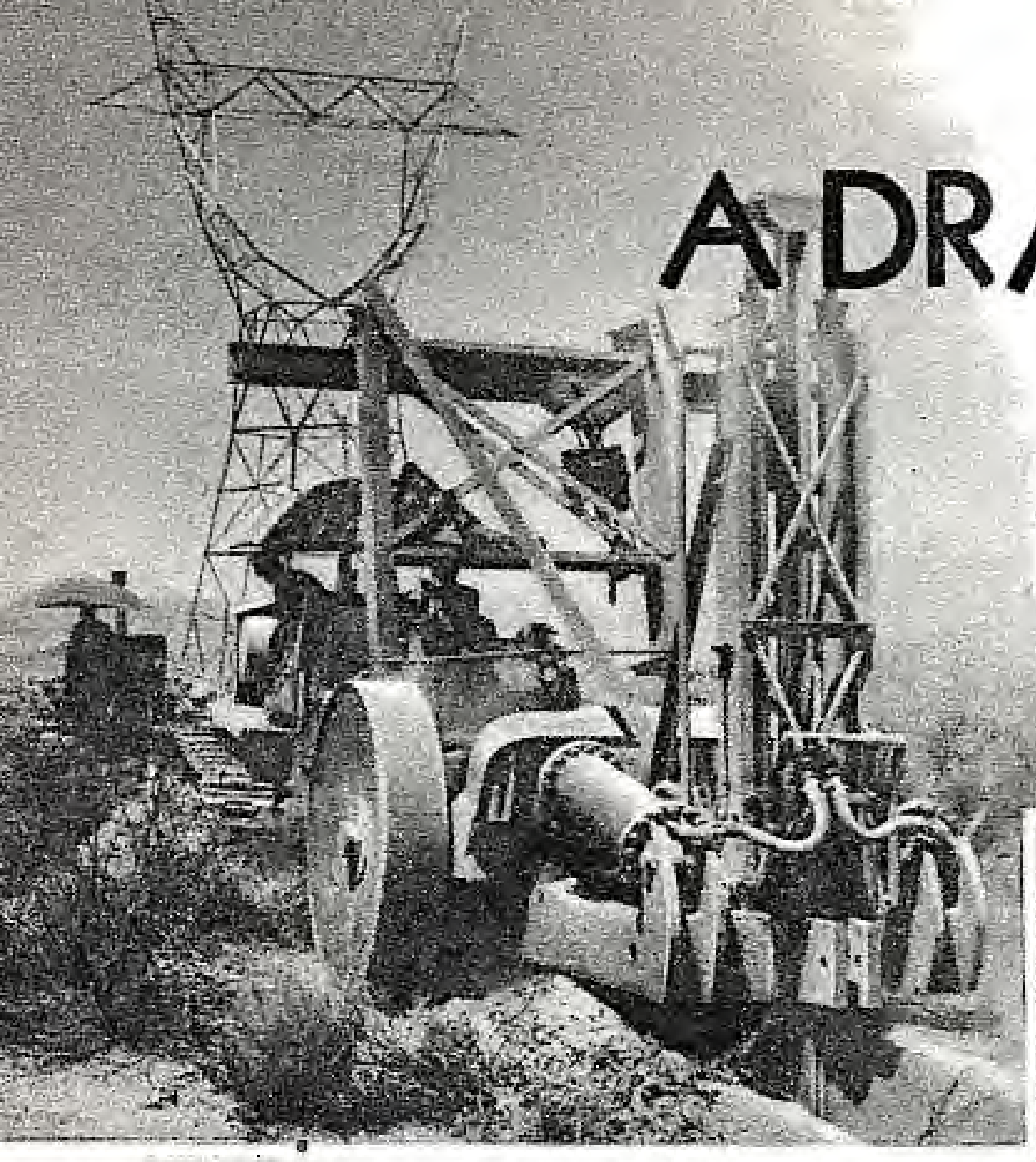
To Succeed Stay Young

"You must actually keep young—if you would succeed at modern research. When you were born, everybody in the world was older than you. Before you were a year old, there were more than two million people in the world younger than you. At 50 you are older than almost nine-tenths of your fellow human beings. When you have reached an age of maturity, the product you turn out is going to be used mainly by younger people than yourself. Youth dominates industry, art, and commerce, and it rules research."

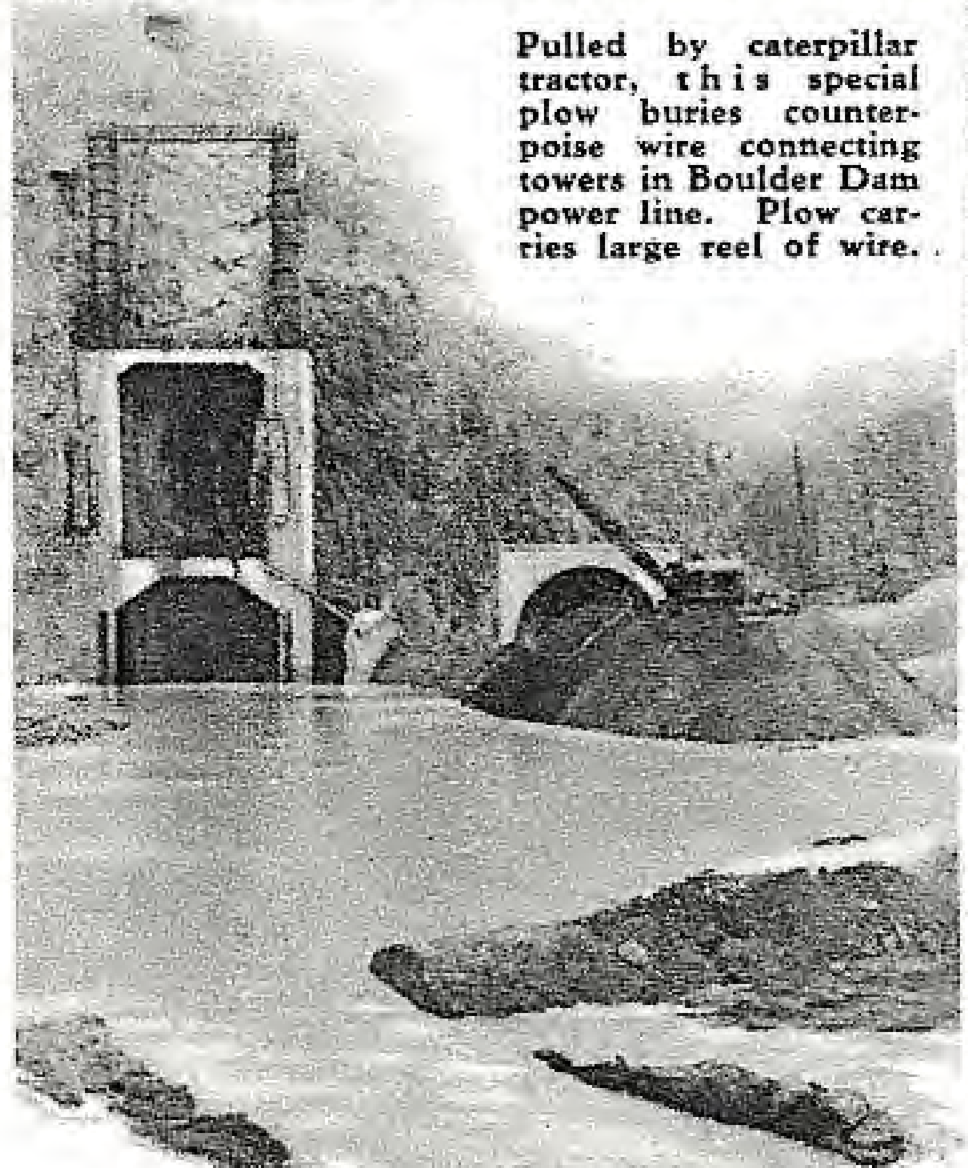
A DRAMA of POWER--TAMING the COLORADO

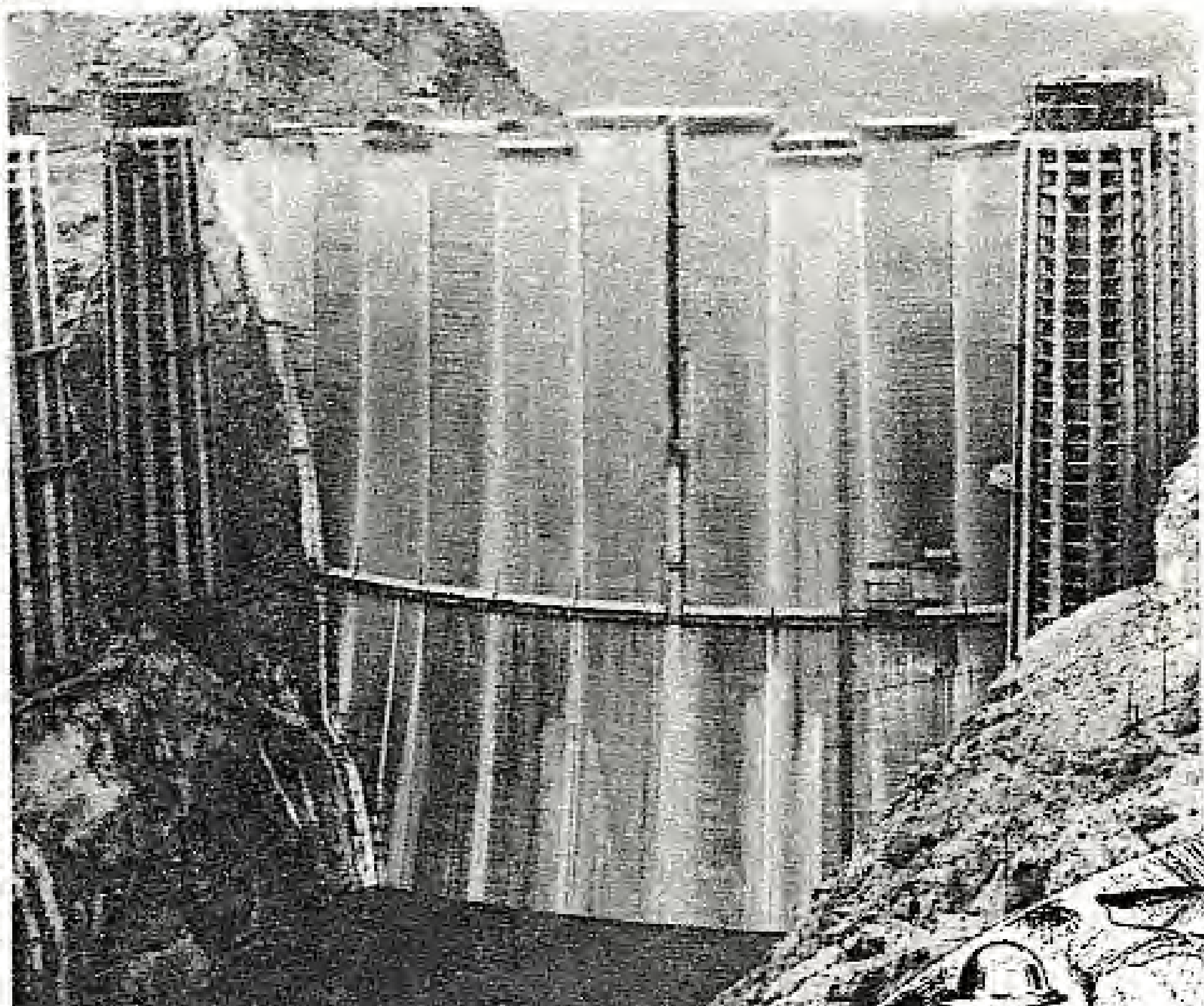
by J. L. BURKHOLDER

Assistant General Manager in Charge of Construction, Metropolitan Water District of Southern California.

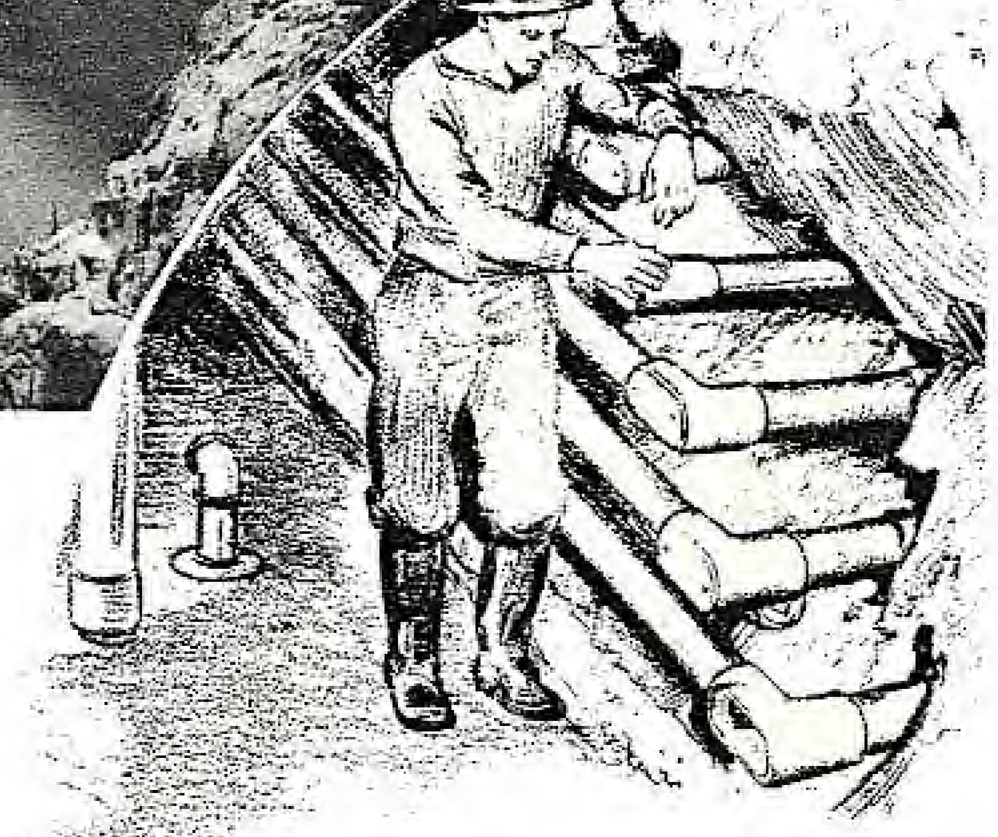


Pulled by caterpillar tractor, this special plow buries counterpoise wire connecting towers in Boulder Dam power line. Plow carries large reel of wire.





Lowering of this 3,000,000-pound steel door closed first of Colorado river diversion tunnels, marked beginning of huge reservoir which will extend 115 miles upstream, flooding area of 227 square miles. Photo at right shows water level rising behind massive Boulder Dam. Intake towers on either side will eventually be submerged, and then supply water for the power generating plant.



Wires in these pipes lead to 400 thermometers imbedded in concrete of Boulder Dam.

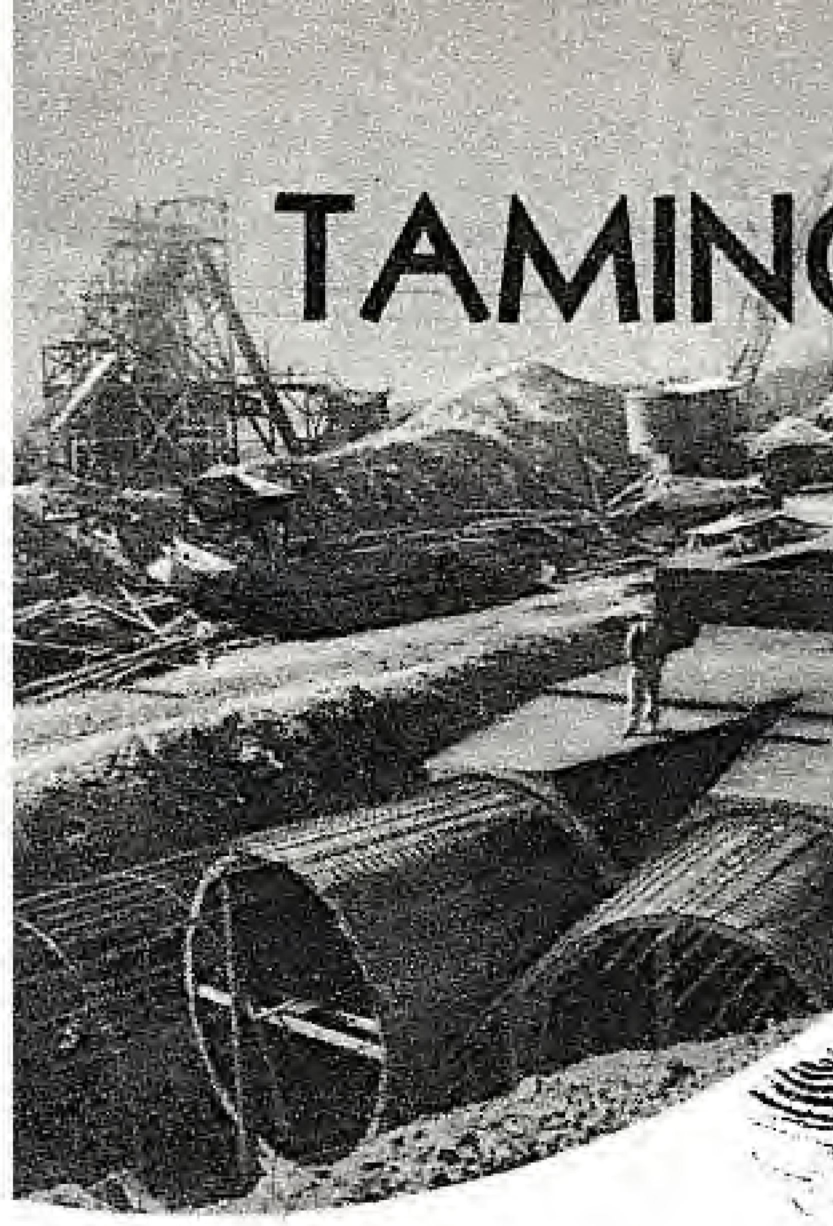
OVER the vast desert region of the Southwest, an empire of power and water is being built. Construction crews of four independent yet interrelated projects are bringing to completion structures which will guarantee to large urban and agricultural regions ample water and electricity for many years to come.

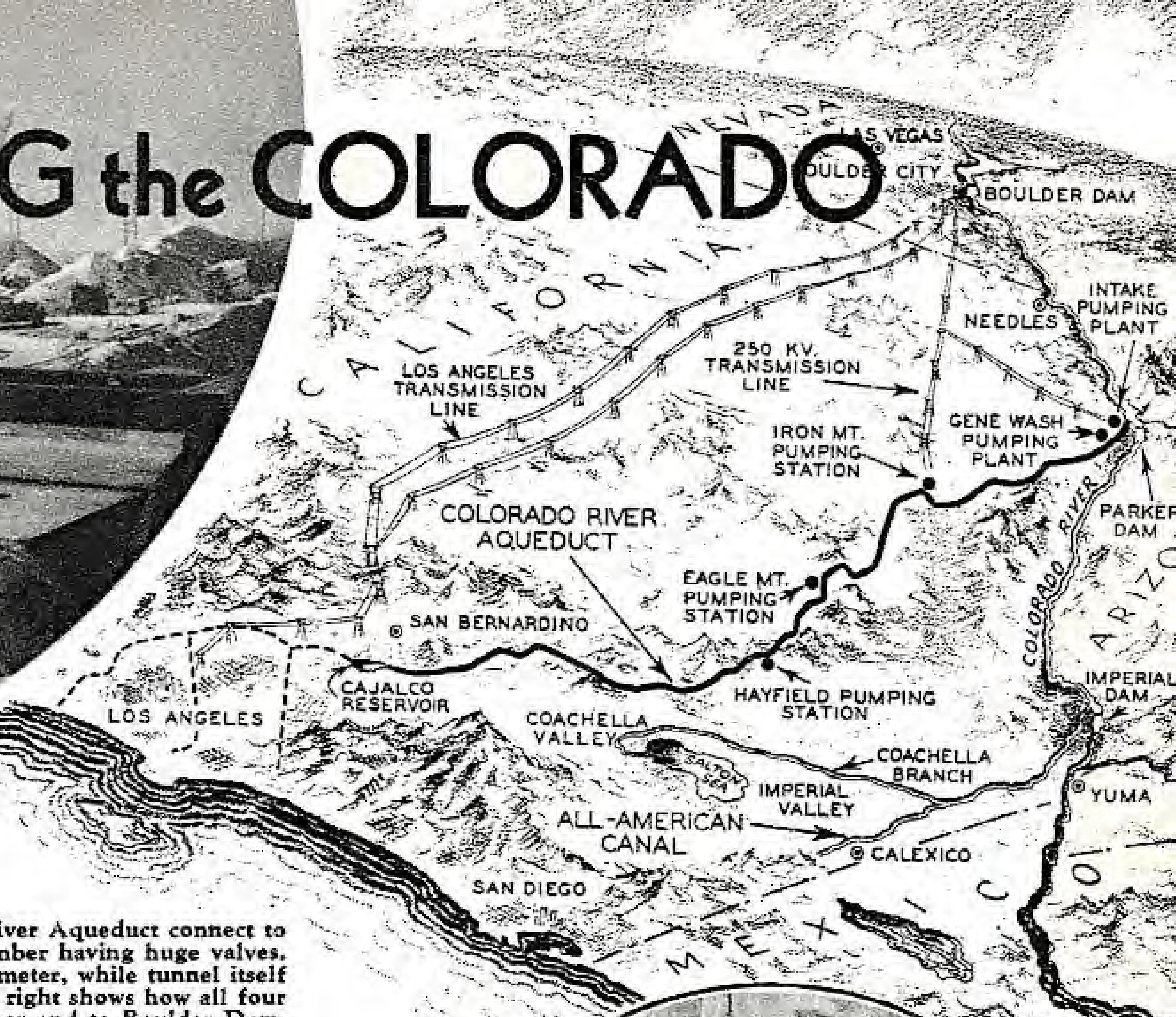
In a few months Boulder Dam, largest structure of its kind the world has ever seen, will be complete. Already the vast reservoir stretching far up the Colorado is filling; in a few months it will contain enough water to cover the state of Connecticut to a depth of 10 feet.

Sixty of the 92 miles of tunnels within the Colorado River Aqueduct system of the Metropolitan Water District have been excavated. When completed this huge aqueduct will be capable of carrying a billion gallons of Colorado River water daily 300 miles to 13 Southern California communities. In addition to being the biggest of the four related Colorado River projects, Southern California's aqueduct will be the largest water carrier ever built by man.

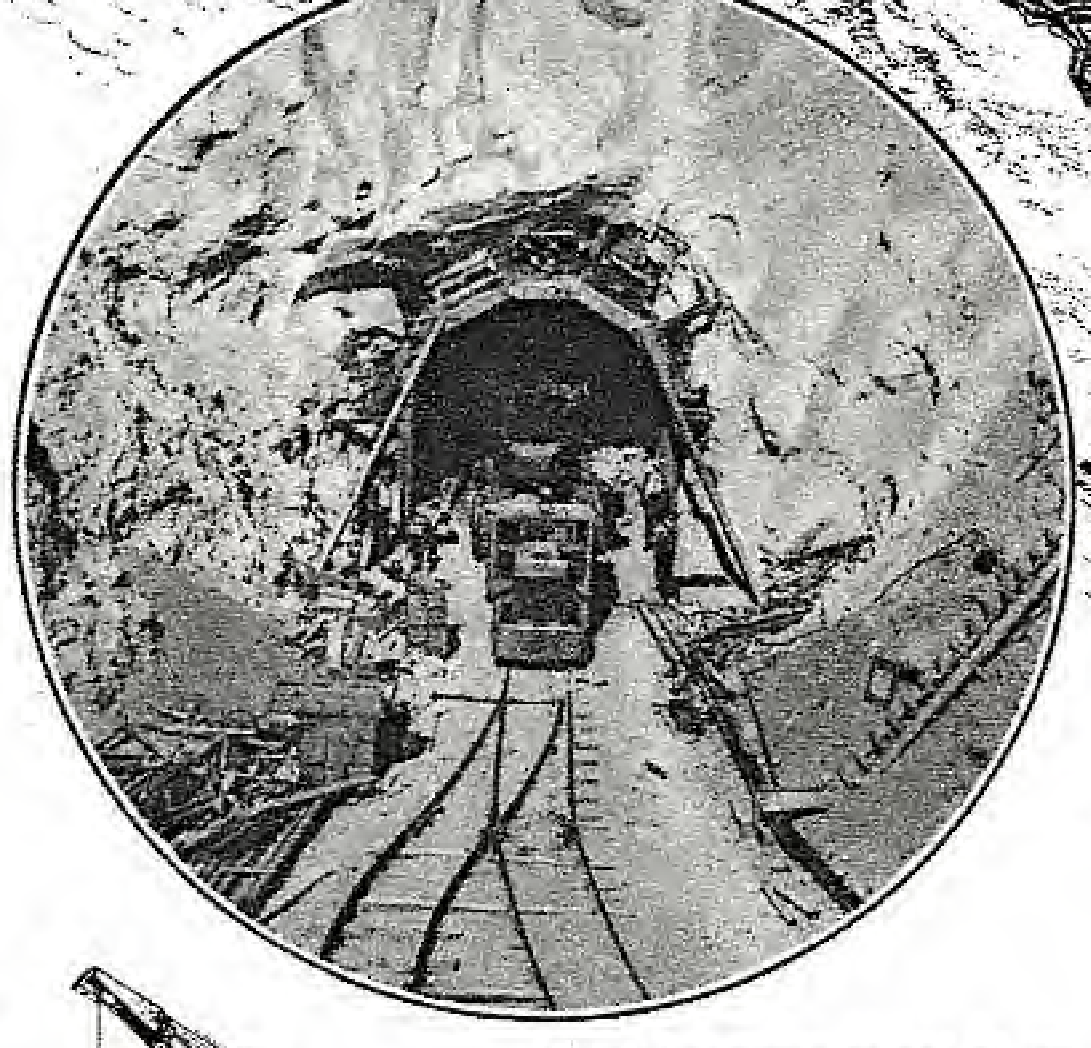
From Boulder Dam, extending 270 miles across deserts and mountains, the largest long-distance transmission line is nearing completion. Early this autumn the last of its 2,680 towers—some of them 144 feet tall—will rise into the clouds, the large hollow conductors will be safely tied in place and the line ready to carry electric energy adequate to light nearly 5,000,000 homes simultaneously.

Along the southwestern border of the United States an 80-mile ditch—the All-American Canal—is being threaded across the desert between the Colorado river and the western edge of the great Imperial Valley. In addition to guaranteeing irrigation water to vast populated areas, this 200-foot canal will bring water to 200,000 acres now unirrigated and therefore unsuited for agriculture.

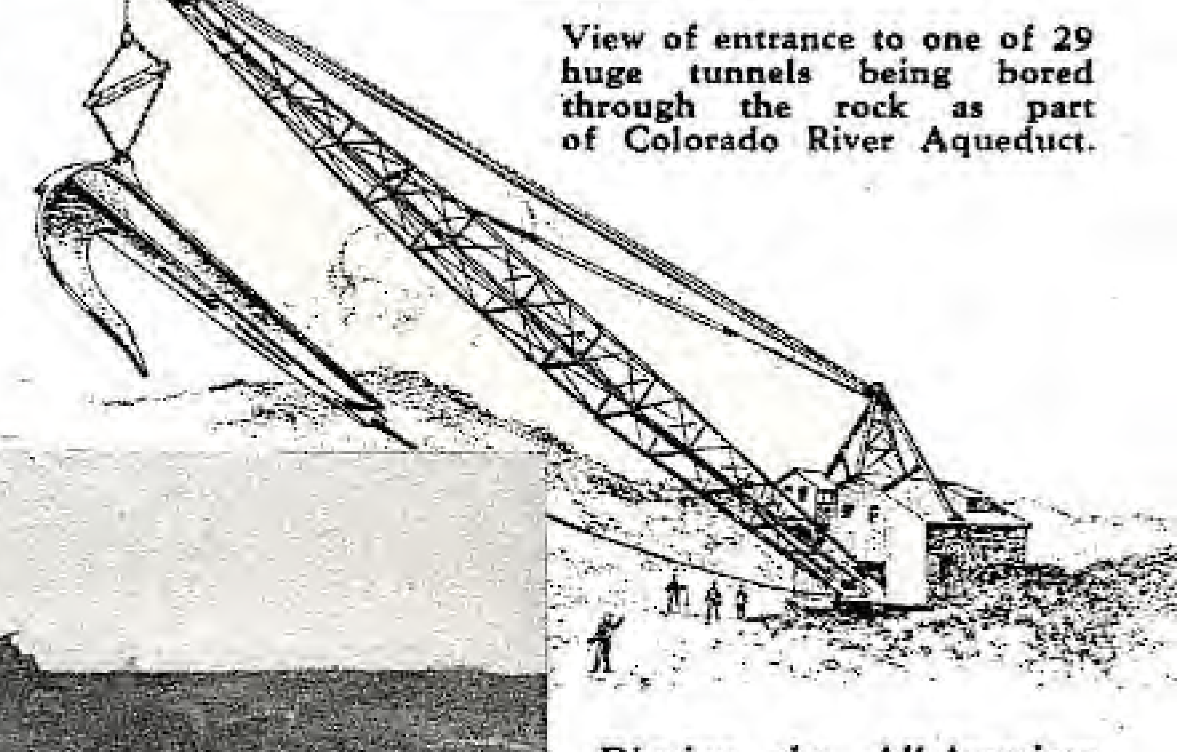



NEVADA
LAS VEGAS
BOULDER CITY
BOULDER DAM
INTAKE PUMPING PLANT
NEEDLES
CALIFORNIA
LOS ANGELES TRANSMISSION LINE
250 KV. TRANSMISSION LINE
IRON MT. PUMPING STATION
GENE WASH PUMPING PLANT
PARKER DAM
COLORADO RIVER AQUEDUCT
EAGLE MT. PUMPING STATION
COLORADO RIVER
ARIZONA
SAN BERNARDINO
CAJALCO RESERVOIR
LOS ANGELES
COACHELLA VALLEY
HAYFIELD PUMPING STATION
IMPERIAL DAM
SALTON SEA
COACHELLA BRANCH
IMPERIAL VALLEY
YUMA
ALL-AMERICAN CANAL
CALEXICO
SAN DIEGO
MEXICO

Double siphons of Colorado River Aqueduct connect to tunnels through transition chamber having huge valves. Each "barrel" is 12 feet in diameter, while tunnel itself is 16 feet in diameter. Map at right shows how all four projects are related to each other and to Boulder Dam.

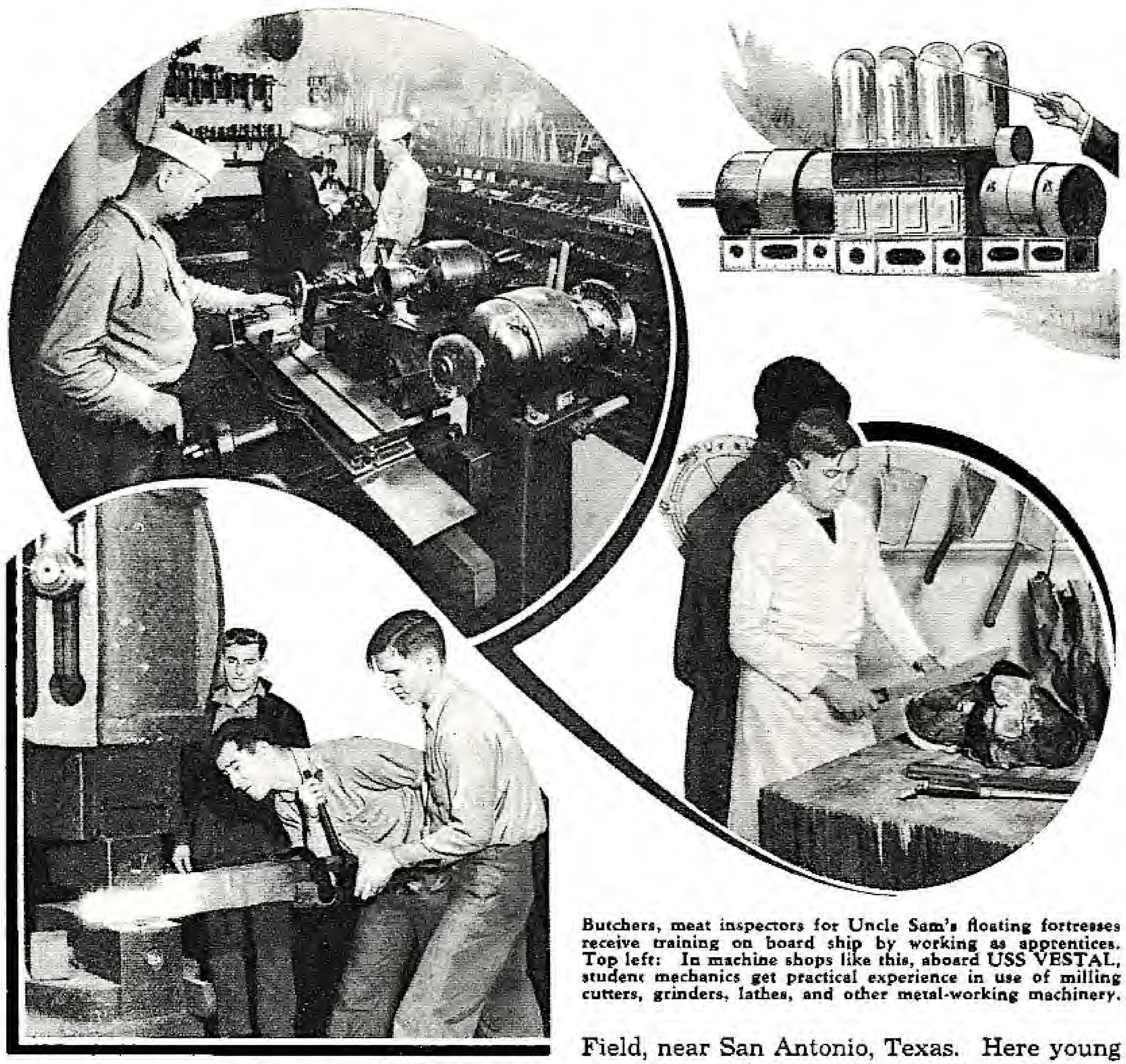


View of entrance to one of 29 huge tunnels being bored through the rock as part of Colorado River Aqueduct.



Digging the All-American Canal. When cement, gravel or loose stone is encountered, dragline operator goes fishing with this ten-ton hook to loosen material. Steel line used is two inches thick.

How UNCLE SAM Trains His FIGHTING EXPERTS



Butchers, meat inspectors for Uncle Sam's floating fortresses receive training on board ship by working as apprentices. Top left: In machine shops like this, aboard USS VESTAL, student mechanics get practical experience in use of milling cutters, grinders, lathes, and other metal-working machinery.

Student blacksmiths and mechanics aboard USS VESTAL become experienced operators of giant steam hammers, presses.

by BOB GORDON

WHEN Uncle Sam needs technically-trained men to man his battleships, air bombers, big guns, radio stations, or even cook meals for his soldiers, he trains them. Each year he selects thousands of young men to be his fighting experts, and develops them for responsible posts in the army and navy. These men are trained to keep his gigantic peace-time war machine running smoothly and efficiently, ready for any emergency.

The best known of Uncle Sam's schools is the Air Corps Training Center at Randolph Field, near San Antonio, Texas. Here young men are paid $75 a month and given free uniforms, board and lodging, while being taught to fly.

The qualifications for obtaining this instruction are high. A candidate must be in perfect physical condition and must have recently completed at least two years in college. Appointments are made from those who apply to the War Department.

Everyone, of course, can't be an airplane pilot. There are many other trades that are taught by Uncle Sam. At Rantoul, Illinois, trades now being taught there to enlisted men include: airplane mechanic, radio operator and mechanic, aircraft machinist, aircraft welder, armorer, parachute rigger and photography. Enlisted men detailed to these courses must have the equivalent of four years' high school education.

At Rantoul, Illinois, enlisted men receive training as airplane mechanics. Aviation engines are mounted on these test stands for student study.

Welding is just another of the many trades taught in government technical schools. Graduates of four-month cooking and baking courses turn out cakes like above.

Even boiler tube repairs are made in machine shops aboard ships by Uncle Sam's students.

The Navy operates a similar aviation school at Great Lakes, Illinois, but its course is more general; the graduates specialize in the jobs they do best after finishing the basic work.

Running a close second to the Air Corps Schools are the Army Signal Corps courses taught at Fort Monmouth, New Jersey. The radio course includes code practice, theory, installation, maintenance, testing and typing. Most Army operators can take from 40 to 50 words a minute, typing the messages direct.

Other Signal Corps courses train men to be telephone and telegraph operators and electricians. The Meteorological Forecasters' School is perhaps the only practical course

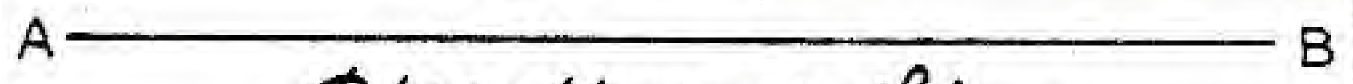
[*Continued on page* 144]

PRIZES for PROBLEM Solutions;

An Inter-Planetary Battle

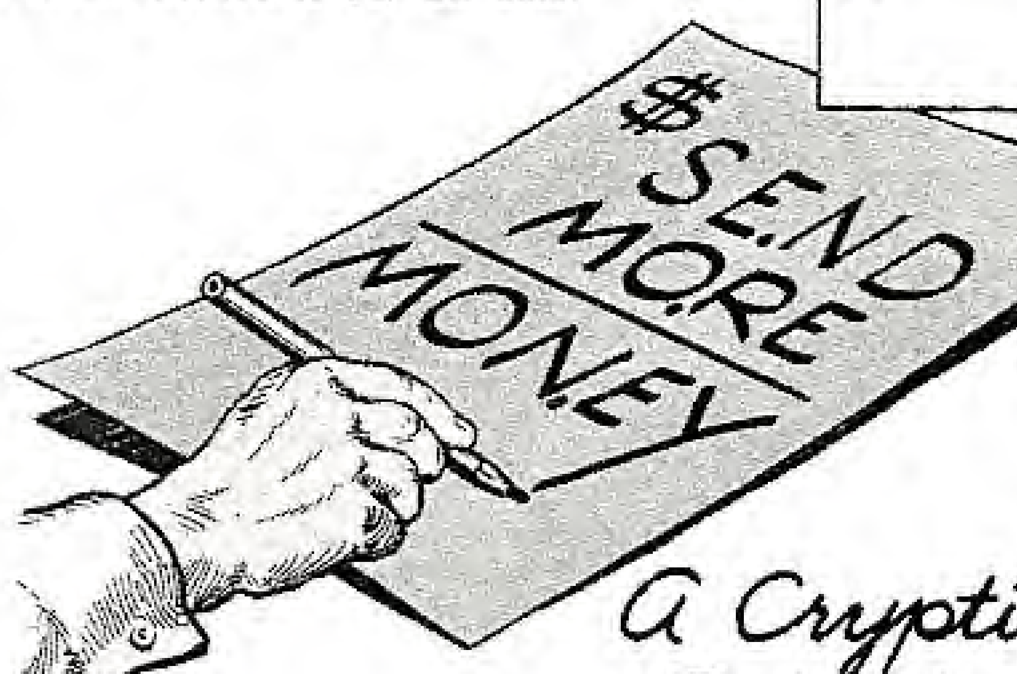
No. 1: What will be the losses sustained by an army of 2,000 Martian warriors in meeting an enemy force of 1,000 Jupiterean soldiers? Assume that all marksmen on both sides are equally good, and that the "target density" is the same on each side, the 2,000 occupying twice the frontage of the 1,000. Further assume that all men start firing at the same instant, at the same rate of 10 death ray bullets a minute, and maintain this rate of firing until killed. Assume that one out of every hundred shots fired kills an opposing soldier. This means that every six seconds there will be a definite number of casualties on each side.

No. 2: By substituting the proper numerals for the letters in the cryptic message at the right, find how much money the student needed to pay his bills.



Bisecting a Line

No. 3: Using a pair of compasses only—no ruler, triangle, or pencil—find the exact middle point of the above line AB. Show your construction clearly, and list, in order, the steps taken to get the result. Your line need not be exactly the same length as that shown.



A Cryptic Addition

THE importance of the military principle of concentration of forces is clearly shown by the rather surprising answer to the first problem in this month's mathematical contest. This is a straight-forward problem, but there are a number of different ways of arriving at the answer, some short, some long and tedious.

For those who enjoy drawing circles with a compass, a simple but interesting little problem in geometry is included. It will look easy at first, grow harder as you puzzle along trying to discover the secret, then appear easy again when the answer is finally obtained.

For the simplest and most accurate solutions to all three problems MODERN MECHANIX AND INVENTIONS offers $25.00 in cash prizes, divided as follows: First prize, $10.00; second $5.00; and ten third prizes of $1.00 each. Elaborate, artistic solutions will receive no more consideration than neatly typewritten or hand-written entries.

Contestants should give age, occupation, and education, though this information will not be considered in awarding the prizes.

Your entry should be postmarked before May 25, 1935. Decisions of the judges will be final, and no entries will be returned. In case of ties, duplicate prizes will be awarded. Answers to these problems and names of the the winners will appear in the August issue.

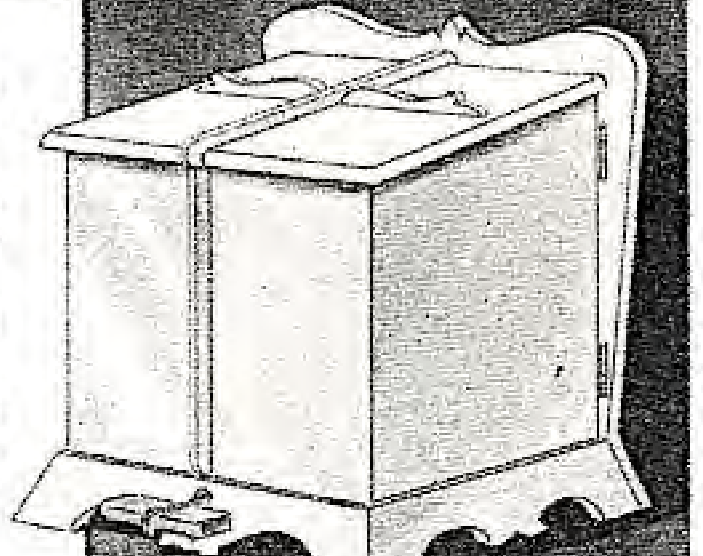
Employes of this magazine or their relatives are not eligible to compete. You don't have to buy a copy or be a subscriber to enter. Address Problems Contest, MODERN MECHANIX AND INVENTIONS, 529 South Seventh St., Minneapolis, Minnesota.

NOVELTY ENTRANTS win $125

WINNERS of the $125.00 in cash prizes offered in the February, 1935 MM Home Novelty Contest are announced on this page. This contest is the third in a series of four offering to Modern Mechanix and Inventions readers a total of $500.00 for home improvement ideas. Winners in the fourth contest will be announced next month.

From the flood of entries, many including photographs or even the completely-built project, the judges picked that of Dan B. Blair as winner of the first prize of $60.00.

His plans and article are reproduced here.



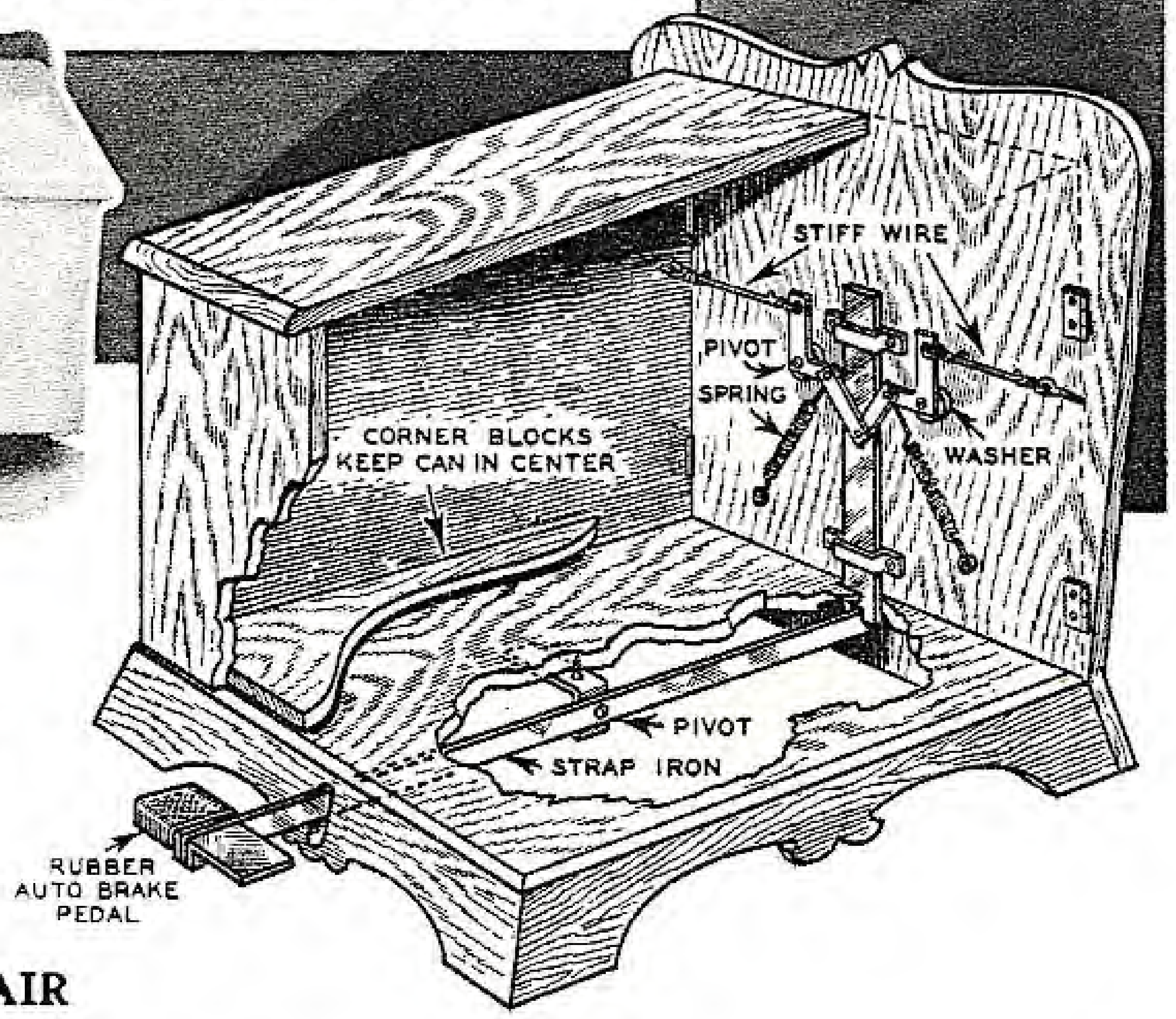


Photo and drawings above show construction of ingeniously-designed container for kitchen refuse can. Pressure of foot on pedal swings open doors to reveal pail; doors automatically close when pressure is released. Stenciled design on sides of container may be added if desired. If box is increased slightly in size, discarded tin cans or other bulky objects can be kept alongside the pail.

by DAN B. BLAIR

THIS attractive yet inexpensive box for concealing the garbage and refuse pail serves a long-felt want of the housewife who enjoys a neat kitchen. It is easily constructed from scrap material, wood and iron, which can be found in most any home workshop.

The cover can be operated even when both hands are full, simply by pressing the foot pedal. Both doors swing open to reveal a standard size home garbage can, and close automatically when the foot pedal is released.

No dimensions are given for the box, since this will vary with the size and type of can used. Follow the design shown in the sketches, using white pine throughout. Finish with varnish or enamel in a color which will harmonize with that of other furnishings in your own kitchen.

HOME NOVELTY CONTEST WINNERS

The following persons, selected as winners in the February, 1935, MODERN MECHANIX AND INVENTIONS Home Novelty Contest, have been awarded the $125.00 in cash prizes offered for practical ideas.

FIRST PRIZE, $60.00: Dan B. Blair, Atlanta, Ga. His winning entry appears on this page.

SECOND PRIZE, $20.00: Walter Lindeman, Iron River, Mich.—A novelty child's rolling toy.

THIRD PRIZE, $8.00: F. V. Lant, West Brighton, N. Y.—Metal lighthouse lamp.

FOURTH PRIZE, five of $5.00 each: C. N. Bruce, New Castle, Pa.—Nut-cracking anvil and hammer; E. Loudermilk, Lewisburg, W. Va.—"Scotty" book ends; E. S. Randolph, Chicago, Ill.—Modernistic sewing box; Fred von Kaenel, Denver, Colo.—Cocoanut shell clock; D. C. Marshall, Manhattan, Kans.—Log cabin book ends.

FIFTH PRIZE, six of $2.00 each: T. O. Johnson, Whitman, Mass. — Beverage tray; Bob Warner, Drummond, Wisc.—Burned wood novelties; Paul Krichbaum, Battle Creek, Mich.—Cigarette machine gun; L. A. Croft, Provo, Utah—Windmill radio lamp; A. D. Bequette, Cottonwood, Ariz.—Photo statuettes; J. W. Timmons, Emporia, Kans.—Cigarette holder.

Training Tomorrow's Baseball Stars ...

William Harridge, author of this article, is shown above opening American League season. Right—Bill Terry works out on a lawn roller during training with the New York Giants.

Top—Babe Ruth and his trainer, Artie McGovern, condition on the rowing machine. Lower—Lou Gehrig, Yankee star, chops wood to build up muscle.

Above—High-low, a training game which sharpens the eye. These Giants bat the ball in turn and must keep it in the air

Charlie Grimm builds up the Chicago Cubs at the Catalina Island camp with this exercise that resembles rowing.

by
WILLIAM HARRIDGE

President of the American League of Baseball

ONE of the surest harbingers of spring is the appearance in the newspapers of the box scores of the baseball spring training exhibition games. But the story behind these apparently meaningless non-championship encounters is one that embodies high expenditures, the heart-breaking tragedy of the rookies who can't make good and the painful tedious grind of muscle hardening.

The major leagues spend more than a half million dollars each spring to prepare their highly-geared baseball machines for the six-month campaign which follows. This tremendous expenditure must be anticipated before there is any assurance that a single nickel of it will be returned to the harried baseball proprietor.

To the casual observer, the life of a baseball player may appear to be one of ease with a pretentious salary to safeguard the future and not more than three hours of work (or play) on days when it doesn't rain. The magnate's job may seem to be merely a matter of counting the many thousands of paying customers who pass through the turnstiles.

These are mistaken impressions, for not more than four major league clubs finished the 1934 season without a huge loss. The Chicago Cubs went $100,000 into the red. The late Phil Ball, owner of the St. Louis Browns, lost more than a million dollars in five years. Charles A. Comiskey, who once knew the winner's glory, had spent twice that sum in an effort to rebuild his White Sox from the wreck left in the wake of the scandal which ruined his ball club in 1920.

But this is the story of the magnate. What of the player? Major league clubs will take an average of thirty to forty players to the training camps each spring. Many hopeful "rookies" are doomed to disappointment at the outset, for on May 16 the number of players in active service in each club must be cut to twenty-three.

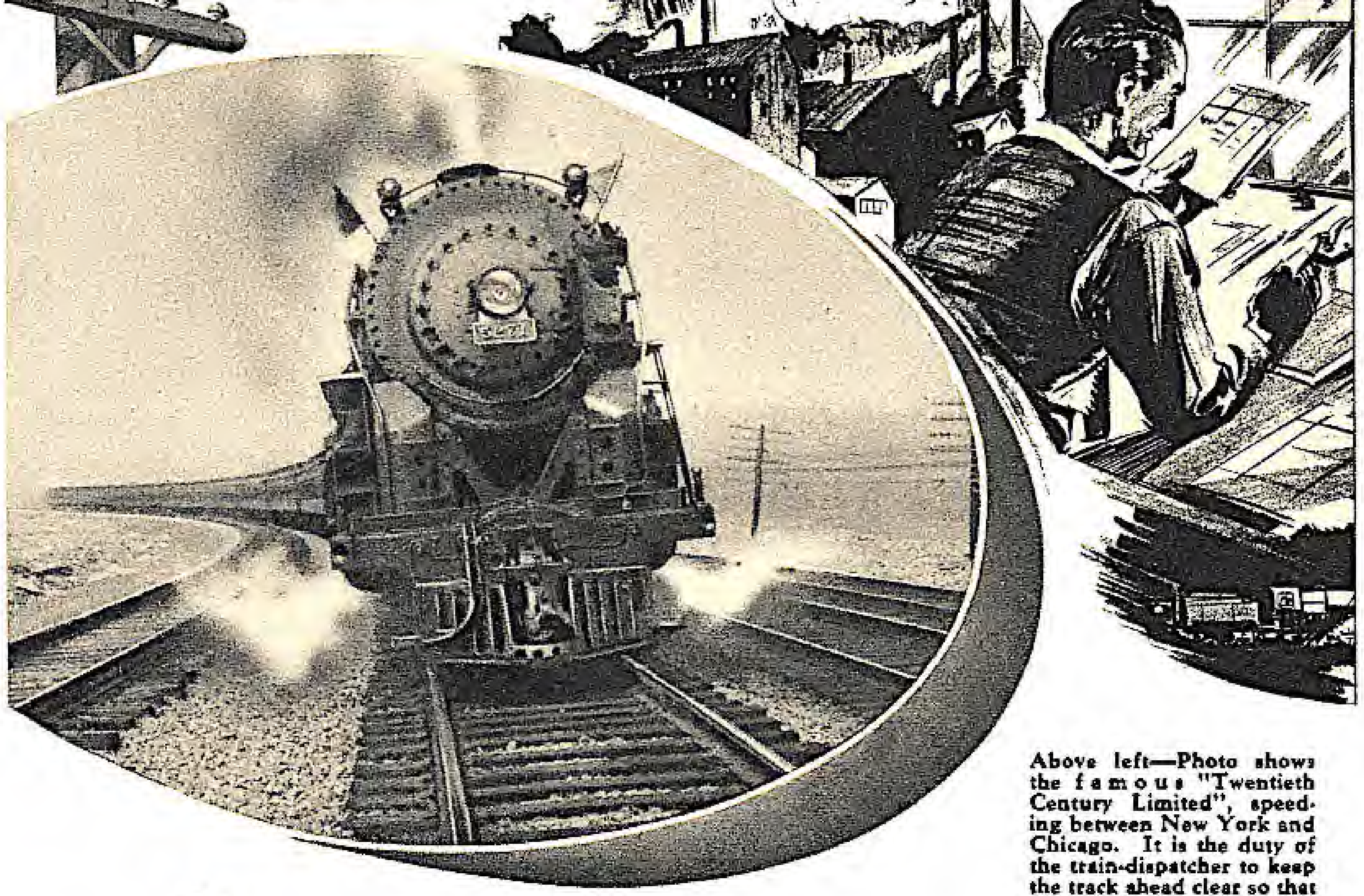
No opportunity must be overlooked to discover new talent among the young rookies who clutter up the camps. Because each must have his chance to prove major league worth, these youths are given every attention in the clubhouse. They come and go and, in most cases, are never heard of again, but this must not deter from the vigilance necessary to bring out the stars of tomorrow.

Every camp has a definite daily routine which varies according to the discretion of the manager. The program runs something like this: 8:30 a. m., call to awaken; 8:35 a. m., second call; 9:00 a. m., breakfast; 10:00 a. m., report to training field; 12:30 p. m., light lunch in clubhouse; 1:00 p. m., resume training; 3:00 p. m., cease training; 7:00 p. m., dinner; 12 midnight, retire.

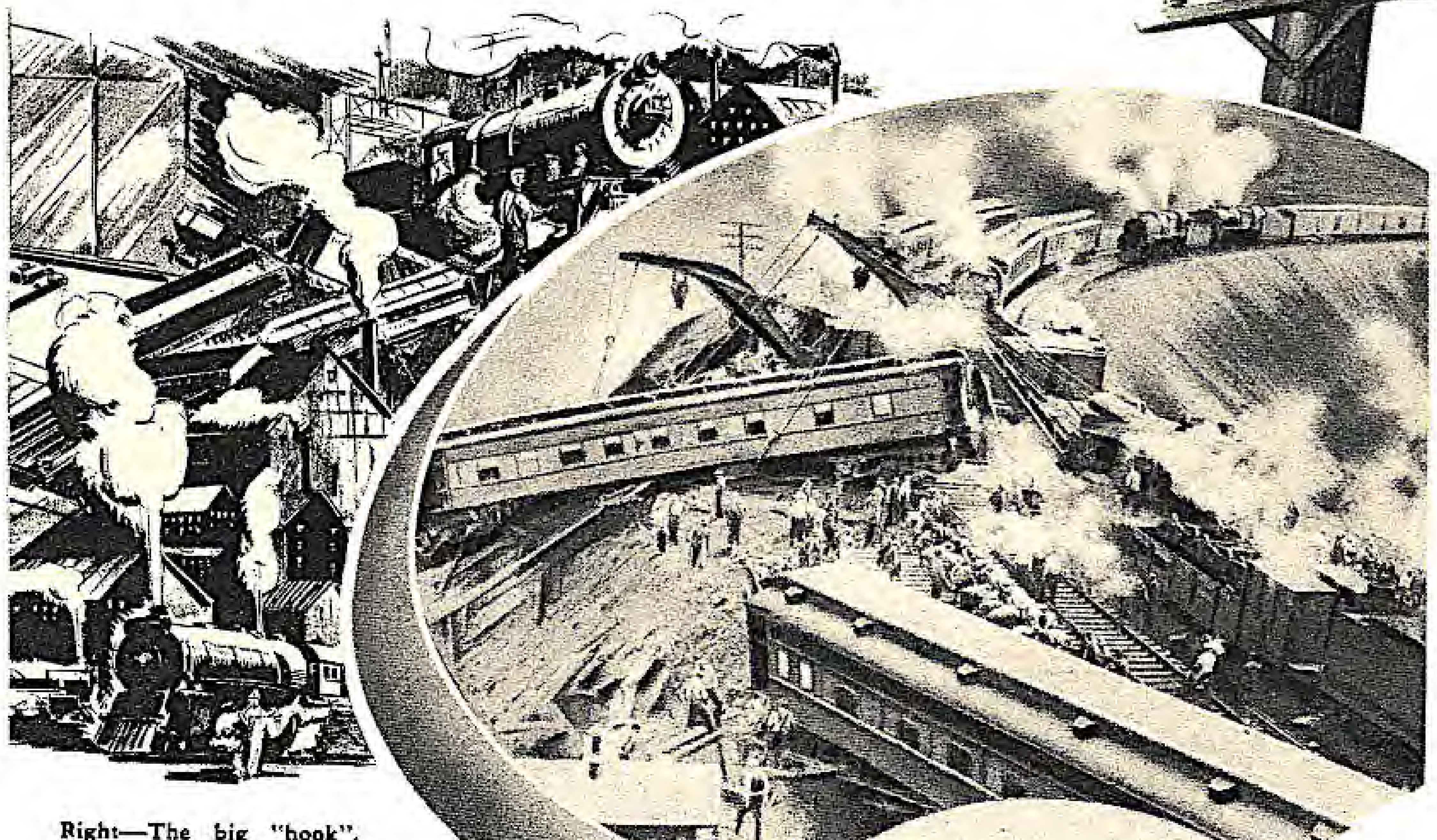
The hotel telephone operator has a standing order to call every player at 8:30 a. m. A second call is put in five minutes later to arouse late sleepers. The breakfast meal may be a little heavier than the average person's breakfast to provide adequate sustenance for the day's training requirements. The diet must of course be varied to include fruit, proteins and a moderate quantity of alkalines. An inspection of the dining room check will reveal any violations.

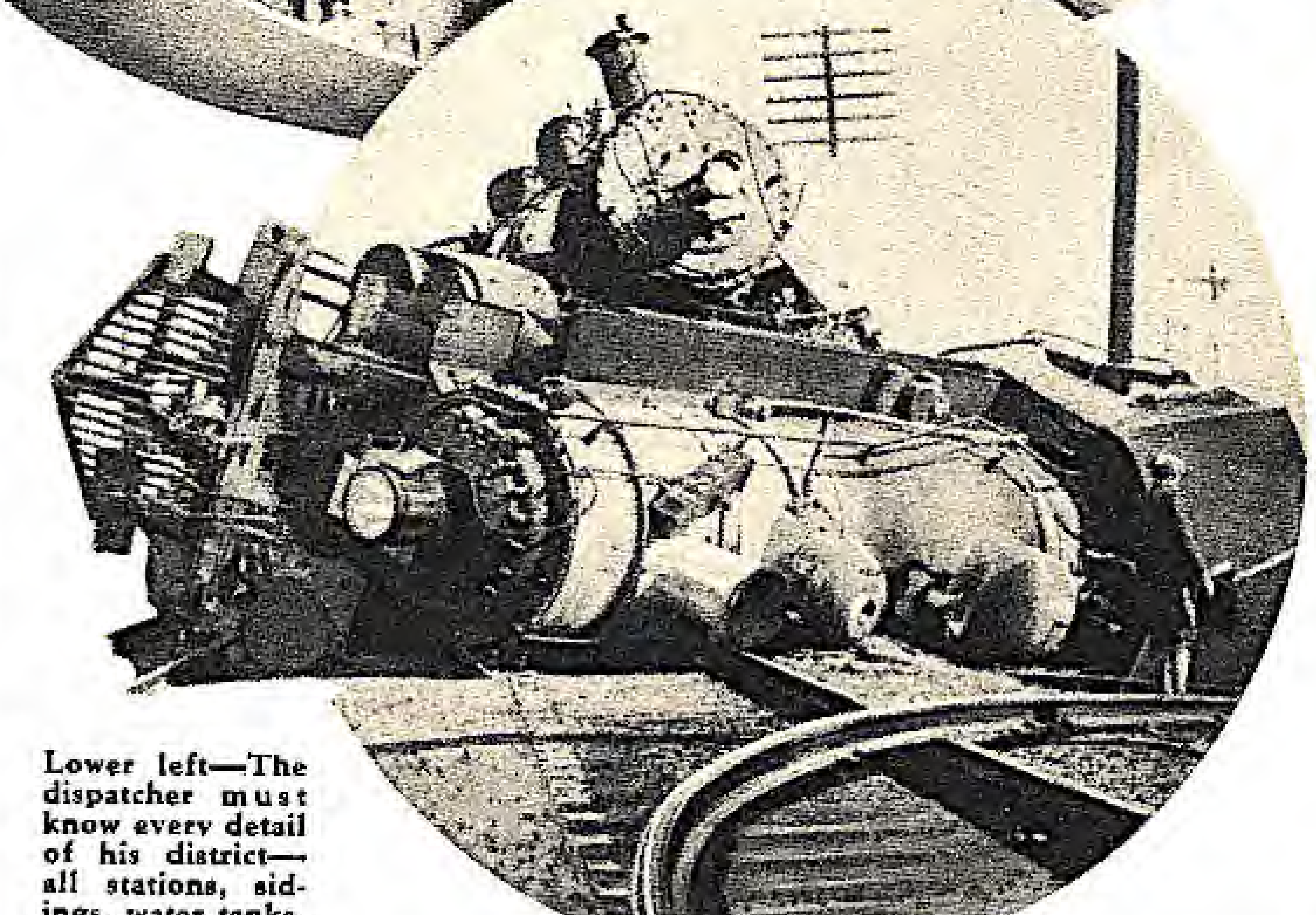
[*Continued on page* 133]

MEET the DISPATCHER



Above left—Photo shows the famous "Twentieth Century Limited", speeding between New York and Chicago. It is the duty of the train-dispatcher to keep the track ahead clear so that there will be no delay in the regular schedule times.





Right—The big "hook", or wrecker, clears the track to maintain fast traffic. In circle—Two passenger trains collide on a cross-track. Dispatchers must guard against such costly and delaying accidents.

by

ALLEN DALE

WITH a whistle of air-brakes, a seven-car "local" swings carefully onto a side-track at Mowbry Junction. At the moment, no danger is in sight—yet two minutes later, with a thundering roar and a heavy speed that shakes the earth, the iron-clad "flyer" flashes past to disappear almost instantly, enveloped in a cloud of smoke and flying cinders.

Had the "local" remained on the track two minutes longer, there would have been a devastating crash—death and ruin.

So infrequent are collisions that the public does not worry about them. But there is one man who does all the worrying—who guides the destinies of speeding trains and splits seconds to arrange their meetings.

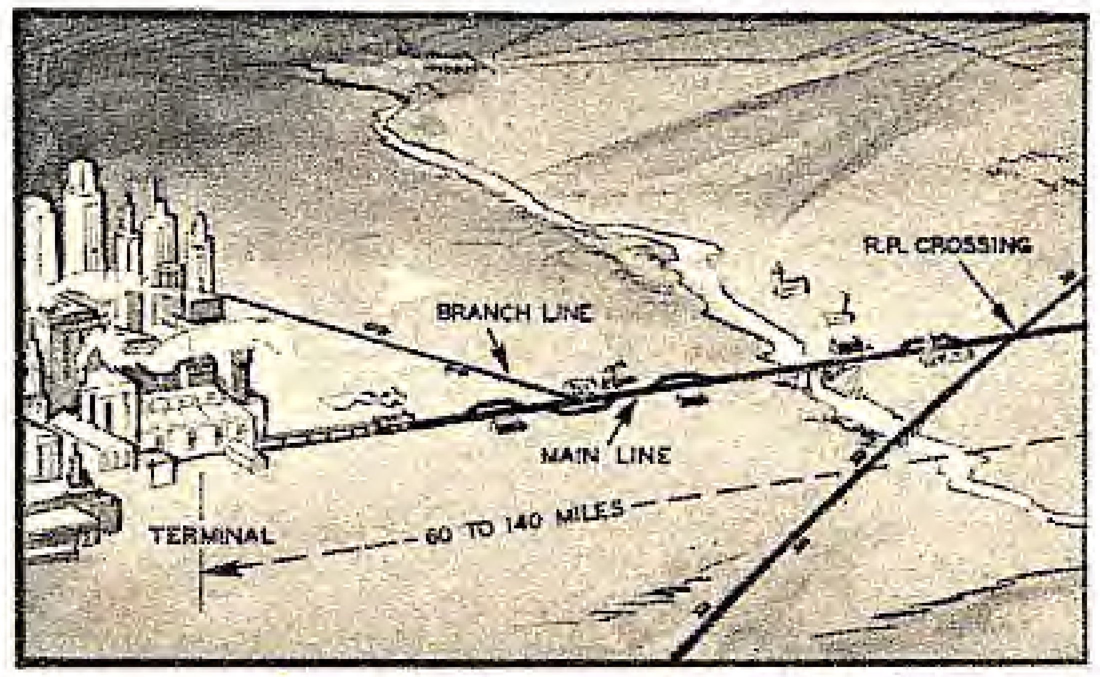
In an office at some point on the superintendent's division he sits erect at a table. A transparent green visor shades his eyes as he studies a broad sheet in front of him. This sheet is lined and interlined, crossed-criss-crossed and scored with spaces that provide a record of movement for each and every train on the road for a period of twenty-four hours beginning and ending at midnight.

He is a busy man, this fellow who is designated as a Train Dispatcher; busy as a trap drummer in a jazz orchestra. He carries more responsibility on his shoulders during the eight hours he works than falls to the lot of an ordinary mortal in a year. You don't hear much about him, because the public is excluded from his domain. He hasn't time to be bothered, for one thing, and it would be dangerous if he were allowed to be. He has lives at his finger ends—hundreds of them each day he works—not to mention a fortune in equipment. It would be bad business if he should slip!

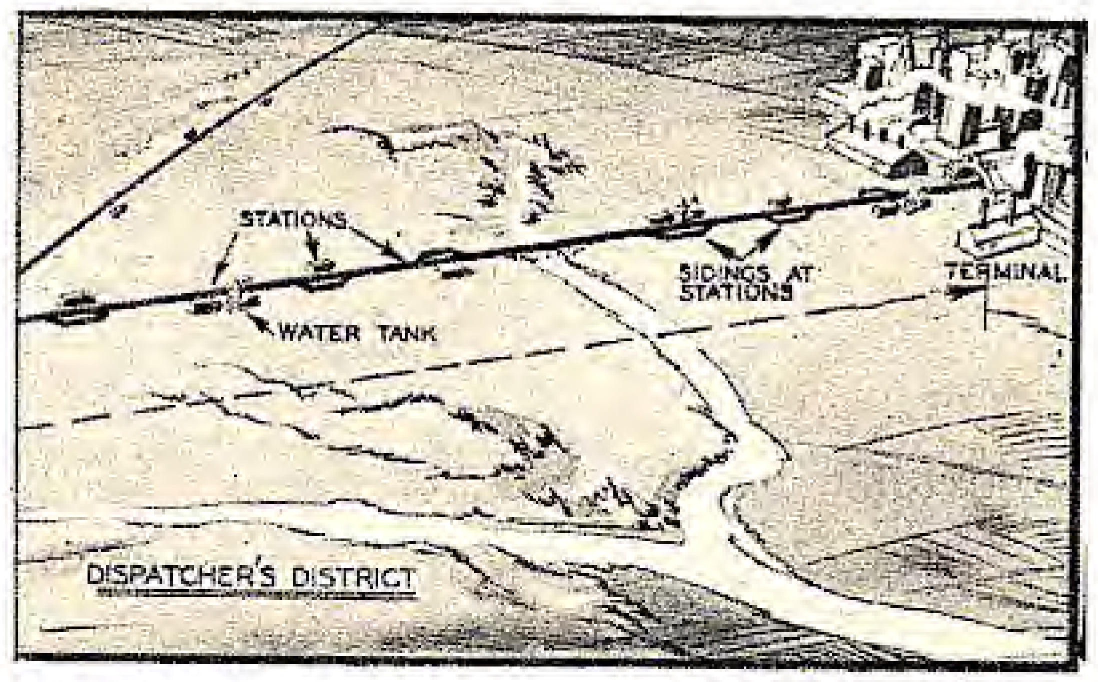
He figures his traffic, estimates speed, operating delays, weather conditions—and makes his meeting points from that deduction. He sends his orders to the operators along the line out of his head and copies them either as they are transmitted in Morse code or as the first operator repeats them over a telephone.

For hours he sits tensely

[*Continued on page* 118]

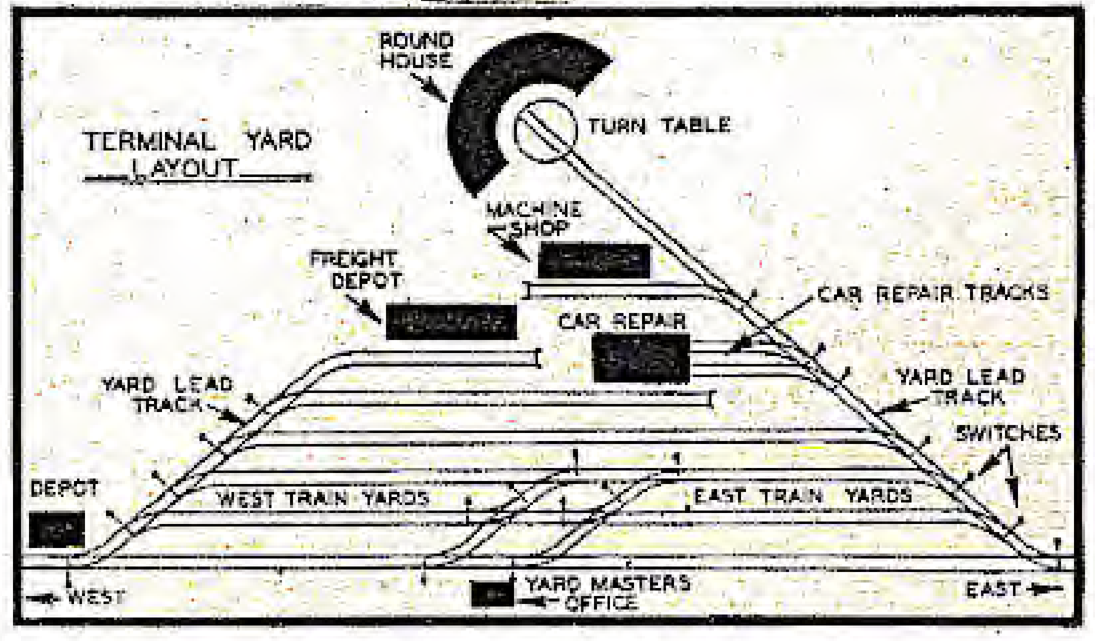


R.R. CROSSING
BRANCH LINE
MAIN LINE
TERMINAL
60 TO 140 MILES



STATIONS
SIDINGS AT STATIONS
TERMINAL
WATER TANK
DISPATCHER'S DISTRICT

Lower left—The dispatcher must know every detail of his district—all stations, sidings, water tanks, and crossings.



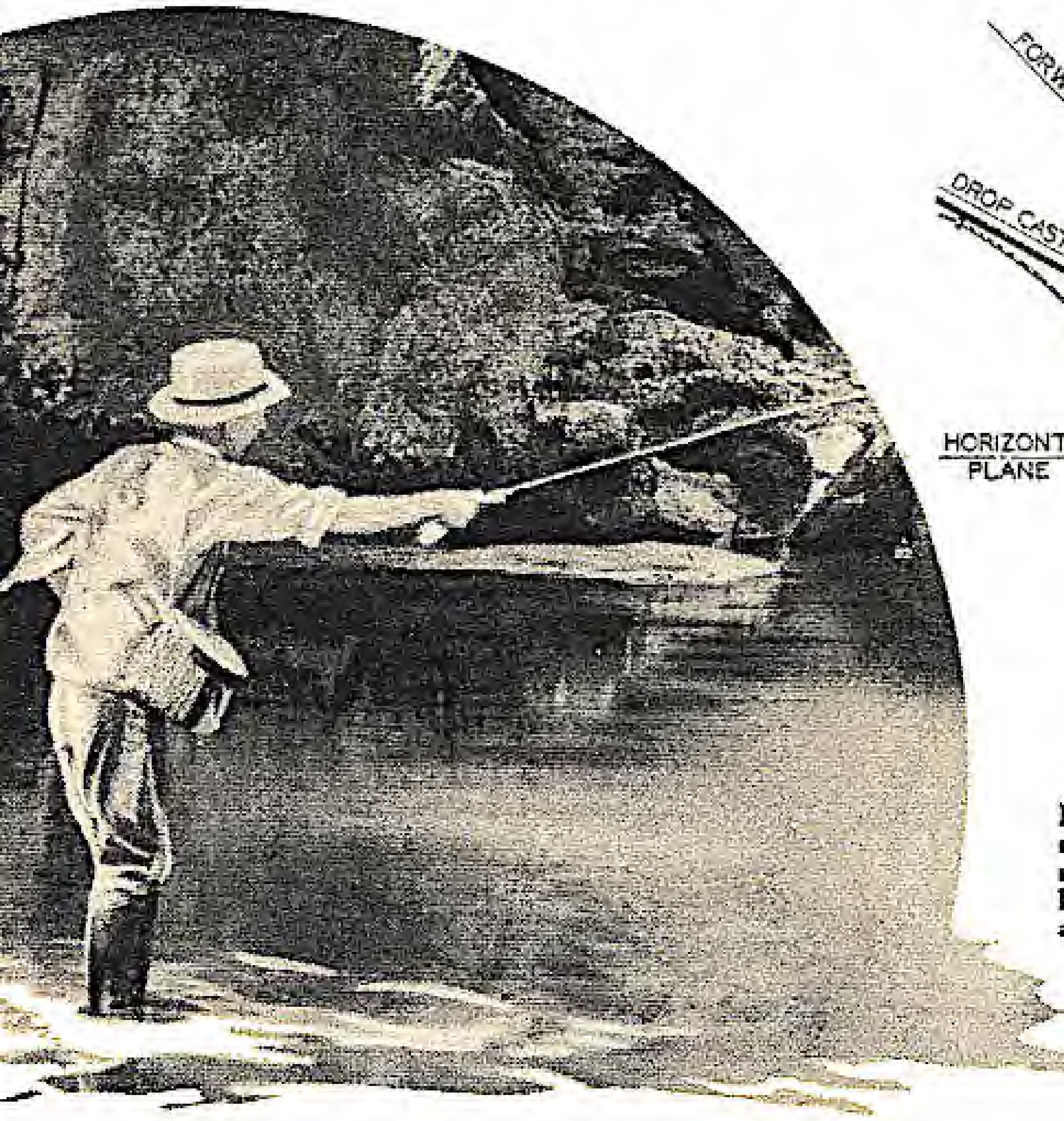
ROUND HOUSE
TURN TABLE
TERMINAL YARD LAYOUT
MACHINE SHOP
FREIGHT DEPOT
CAR REPAIR
CAR REPAIR TRACKS
YARD LEAD TRACK
YARD LEAD TRACK
SWITCHES
DEPOT
WEST TRAIN YARDS
EAST TRAIN YARDS
WEST
YARD MASTERS OFFICE
EAST

Above—A representative terminal yard layout showing tracks where trains await the dispatcher's orders to move.

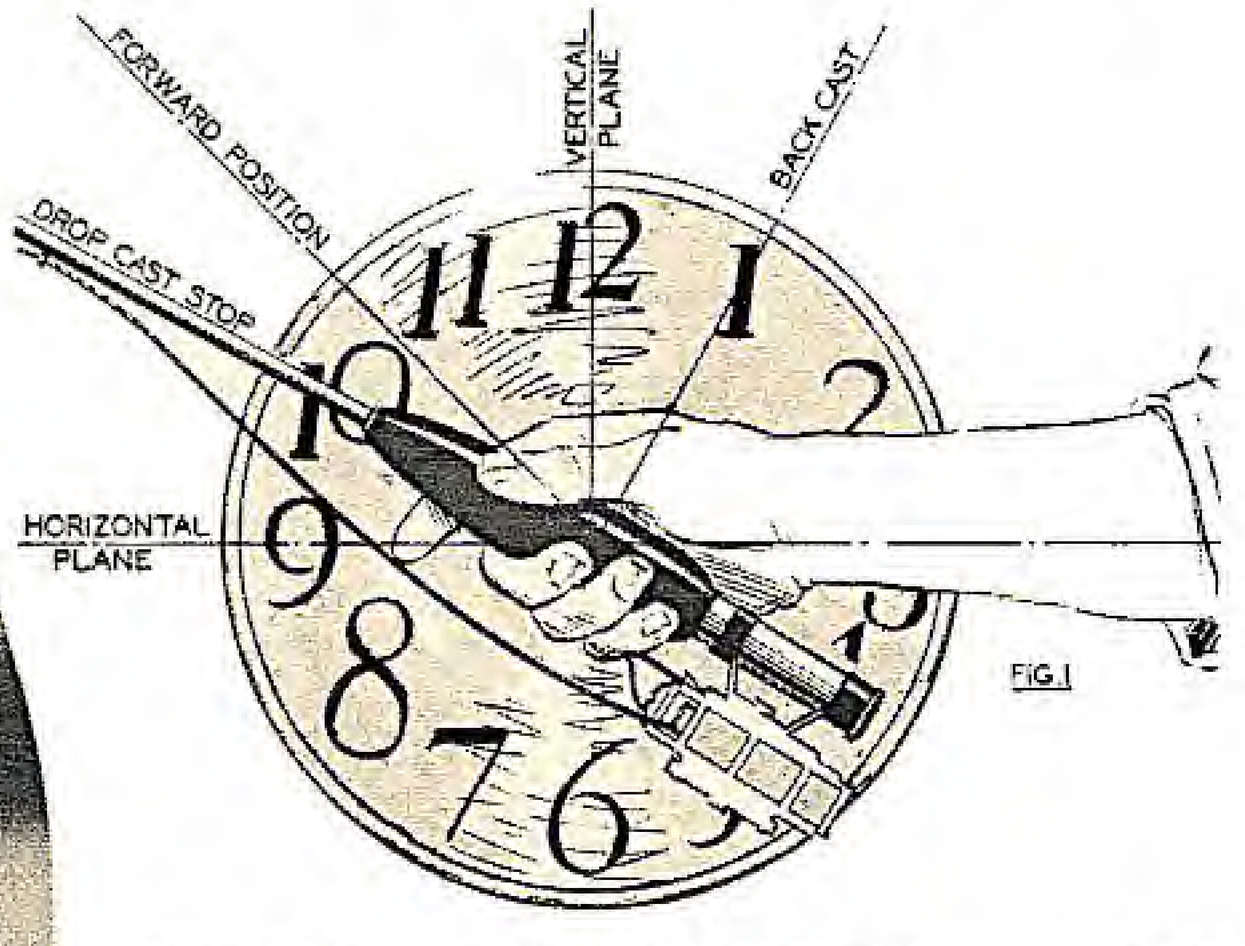
SPORTSMEN'S
CAMPFIRE

UNFOLDING THE MYSTERIES of FLY CASTING

by **ROBERT PAGE LINCOLN**
Hunting and Fishing Editor



The fly caster is "reaching out" to drop fly at distant spot. The novice should try to keep right elbow close to the body.

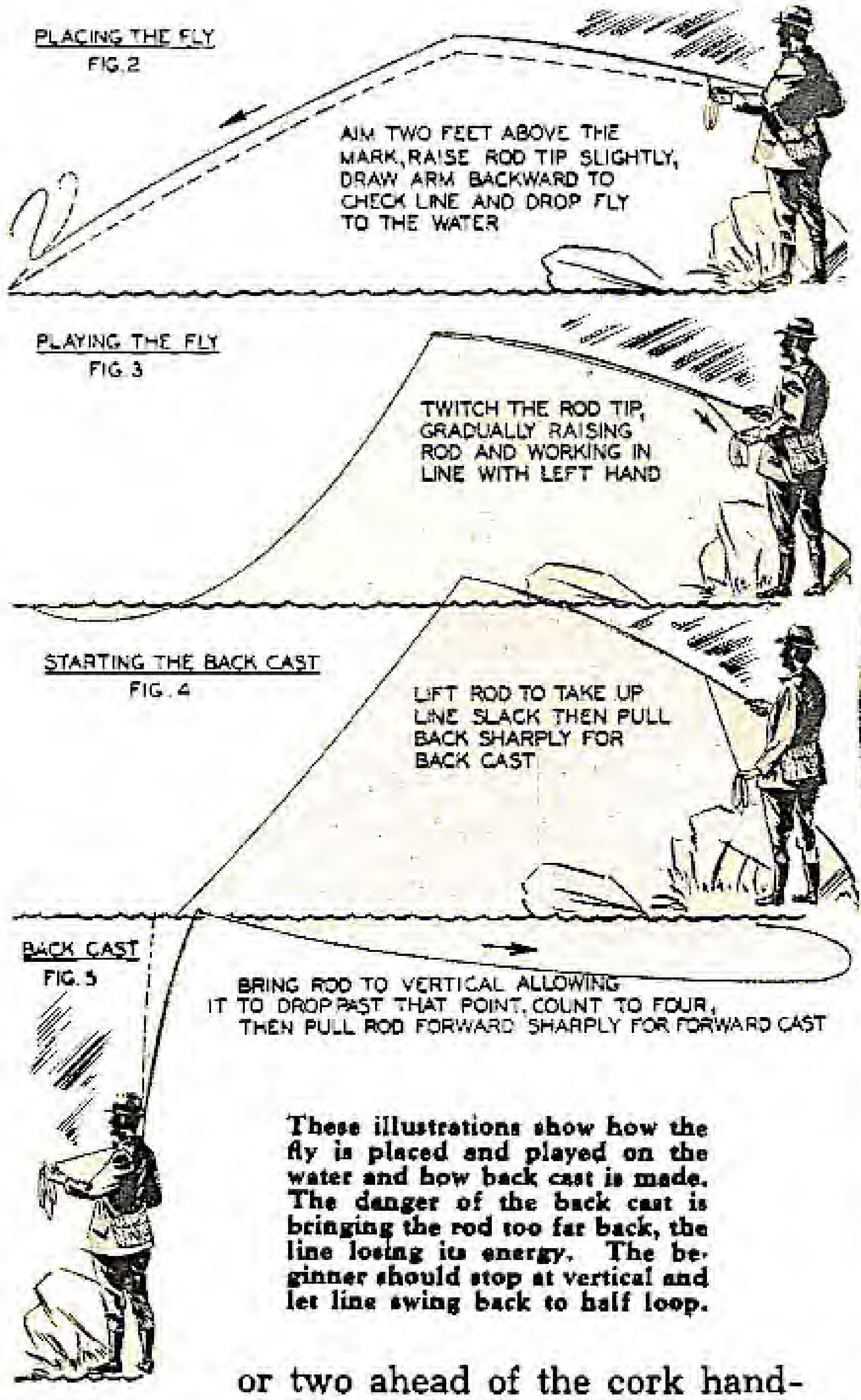

FORWARD POSITION
VERTICAL PLANE
BACK CAST
DROP CAST STOP
HORIZONTAL PLANE
11 12 1
2
9
8
7 6
FIG. 1

Learning by means of an imaginary clock is recommended by some experts. On the back cast the rod is allowed to go slightly past vertical or one o'clock. After counting four, bring rod forward sharply. The rod is stopped momentarily at the forward position before moving on to drop cast stop.

FLY casting is one of the most difficult of fishing sports, yet it has such an appeal that the sportsman who learns fly casting may become so fascinated by it that he is liable to abandon all other forms of fishing. Fly casting requires patience in early stages of learning, but if the newcomer goes about it correctly he can become as proficient as an expert.

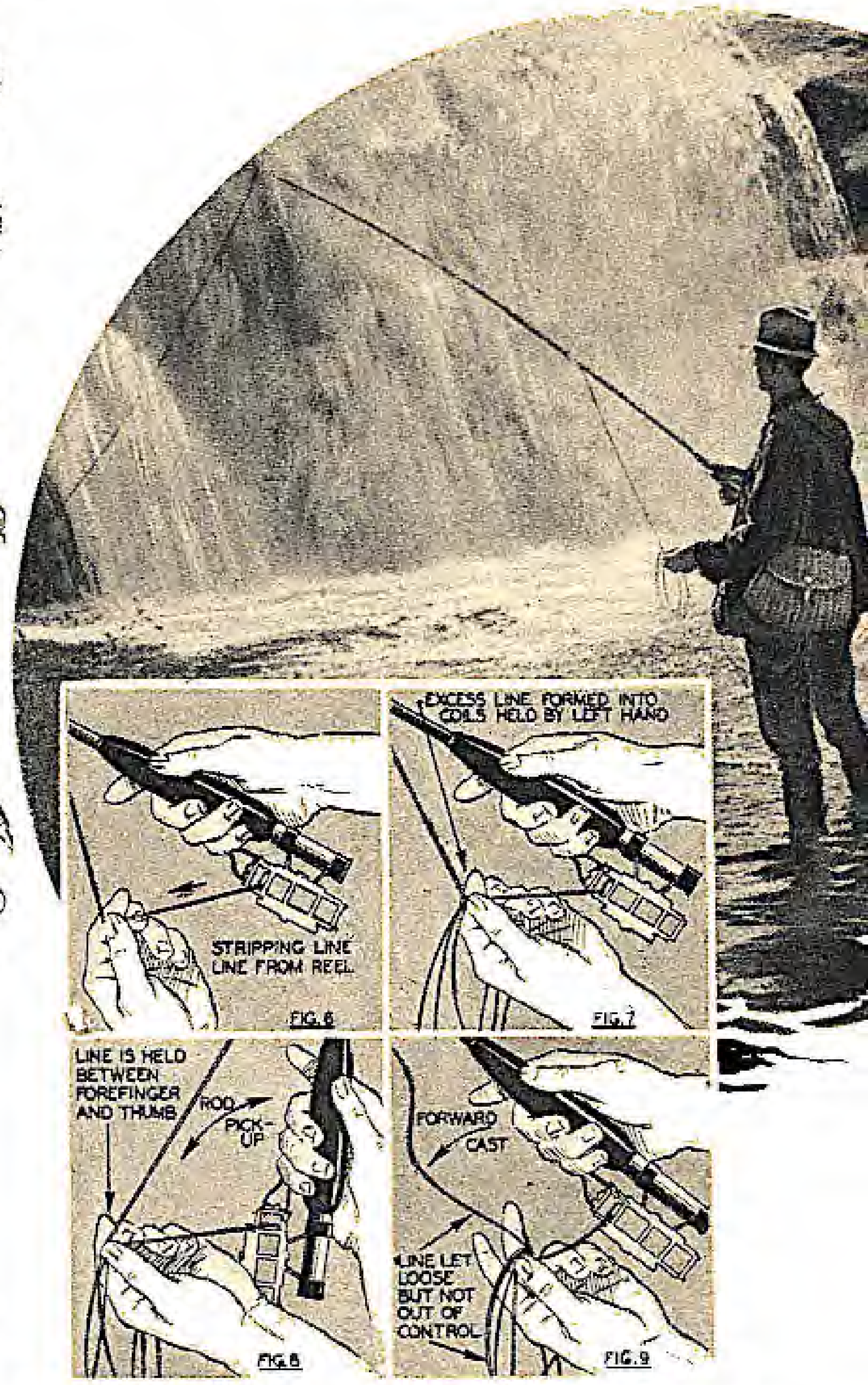
The high-powered angling writer will mention off-hand fifty, sixty and seventy foot casts, as though this were the common thing with the experts and is something that you must live up to if you are to be considered anywhere near perfect. The truth of the matter is that ninety per cent of the trout taken in this country by means of the fly rod are hooked within 30 to 40 feet of the caster's right arm. Only in rare instances is it necessary to go beyond this limit with the reputed 50 and 60 foot casts. Keep this in mind. Keep your eye directed on familiarizing yourself with the casts up to 40 feet from you and forget all about those phenomenally long casts, which have no place in actual fishing, and you will be saving yourself considerable discouragement at the start. A point to keep well in mind is the necessity of providing yourself with a good rod in learning the art of fly casting. A cheap rod has little action, life or resiliency to it. It is safe to say that it is quite impossible to obtain a worthy fly rod under ten dollars in price. The rod priced at fifteen to twenty dollars will be more certain of coming up to required qualifications, and from that figure upwards in price should be all the more worthy of recognition. Some angling writers fail dismally in calling attention to the need of a proper rod with which to learn the art of fly casting. Doing so they leave the student handicapped at the start, for unless the initial directions are properly understood, and the outfit is right, nothing much can be expected.

One must remember to have a proper balance between rod and reel in fly casting. If the reel is too light, the rod will be top heavy. To obtain your proper balance as between the two, let your reel, with the enameled line on it, weigh one and one-half times the weight of the rod. You will find that this will give you a balance point an inch or two ahead of the cork hand-grasp, which is correct. For the five-ounce rod, which is the weight of rod mostly in use in fly fishing, the reel, with line on it, must weigh 7½ ounces; the six-ounce rod (bass size) should take a 9-ounce reel, which, of course, also means including the line. The typical automatic fly fishing reel more nearly fills the bill than the single action reel.


PLACING THE FLY
FIG. 2
AIM TWO FEET ABOVE THE MARK, RAISE ROD TIP SLIGHTLY, DRAW ARM BACKWARD TO CHECK LINE AND DROP FLY TO THE WATER
PLAYING THE FLY
FIG. 3
TWITCH THE ROD TIP, GRADUALLY RAISING ROD AND WORKING IN LINE WITH LEFT HAND
STARTING THE BACK CAST
FIG. 4
LIFT ROD TO TAKE UP LINE SLACK THEN PULL BACK SHARPLY FOR BACK CAST
BACK CAST
FIG. 5
BRING ROD TO VERTICAL ALLOWING IT TO DROP PAST THAT POINT, COUNT TO FOUR, THEN PULL ROD FORWARD SHARPLY FOR FORWARD CAST

These illustrations show how the fly is placed and played on the water and how back cast is made. The danger of the back cast is bringing the rod too far back, the line losing its energy. The beginner should stop at vertical and let line swing back to half loop.

Another important point is the necessity of using a line that is of the proper weight for the rod used. Generally the line selected is too light. Size E lines are about right for fly rods ranging 4 to 4½ ounces in weight. Rods 5 to 5½ ounces will easily carry a D line with good results in casting. Rods that range 5, 5½, 6 and 6½ ounces are best fitted with size C lines. Keep these weights of rods and calibers of lines well in mind, for just as sure as you use a light line on a stiff or comparatively heavy fly rod, just so sure will you be making a bungling start of it at fly casting.


EXCESS LINE FORMED INTO COILS HELD BY LEFT HAND
STRIPPING LINE LINE FROM REEL
FIG. 6
FIG. 7
LINE IS HELD BETWEEN FOREFINGER AND THUMB
ROD PICK-UP
FIG. 8
FORWARD CAST
LINE LET LOOSE BUT NOT OUT OF CONTROL
FIG. 9

In photo above fisherman is playing the fly and is ready to start back cast. Note loops in left hand. Drawings show how line is stripped from reel and held in loops in left hand.

Remember always that it is not the light fly at the leaders' end that you are casting. You are, in truth, casting a line; in fact, to be accurate, it should be called "line casting" instead of "fly casting." As your line is thrown back, the heft of it pulls the rod back and

[*Continued on page* 126]

SPORTSMEN'S CAMPFIRE

SURF FISHING Lures Inland Anglers to Sea

Surf fishermen on a California beach sit with feet braced ready of any denizen of the deep to seize lure.

At top—The surf cast is made with both hands. Above—Battling a large fish. Note the butt rest for the rod. At left—Guitar fish caught in the Pacific surf.

by PAUL W. GARTNER

IN THE shifting troughs of sand below the never ending breakers of the sea swarm hungry denizens feeding upon bits of shell fish, sand crabs, and rock worms. These fish are the quarry of surf casting, a sport that is attracting many inland anglers to the seashore.

The southern Pacific offers the surf caster a large variety of fish. On warm moonlit nights giant tiger, leopard, and oil sharks can be caught. Their weight sometimes exceeds 200 pounds.

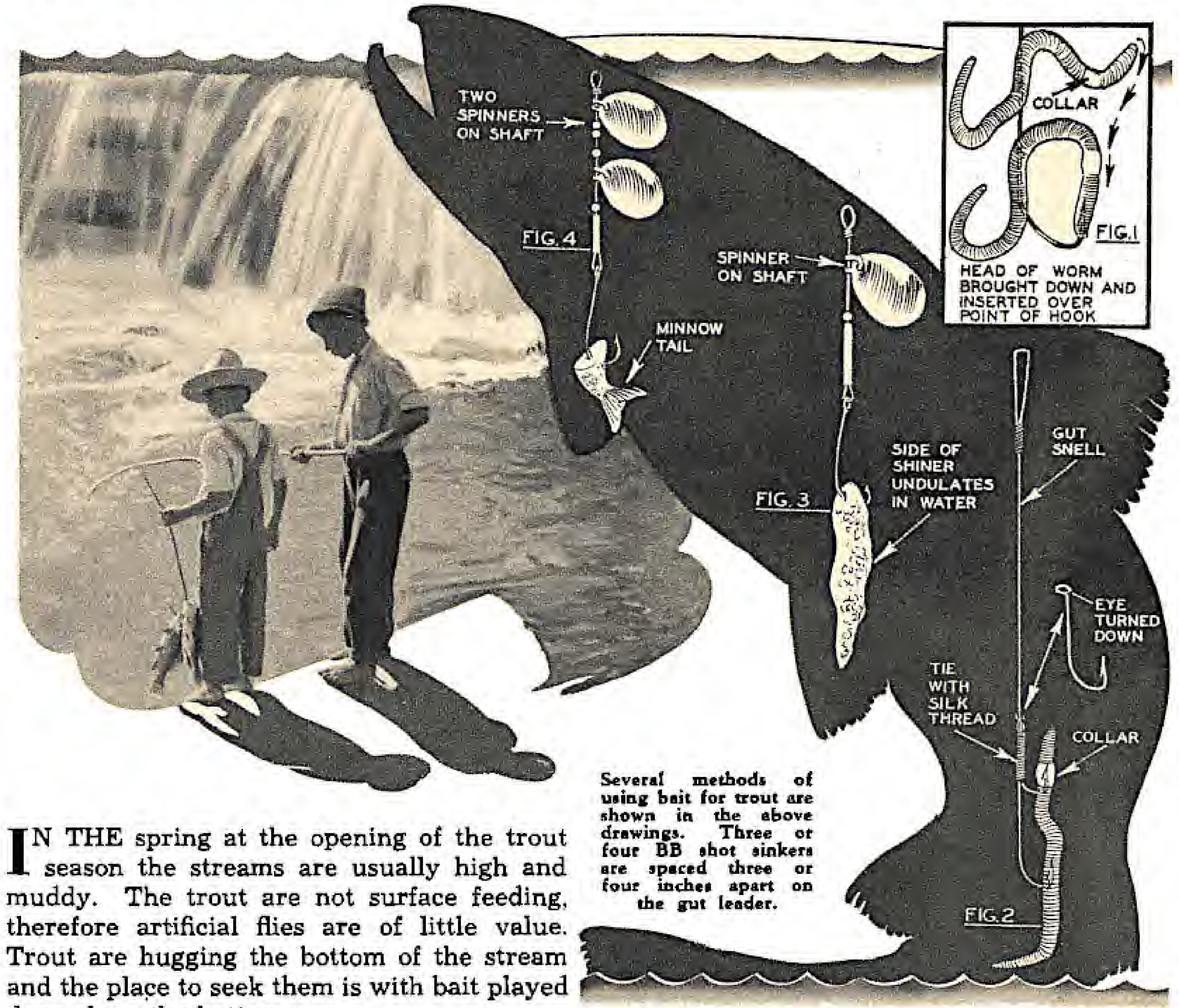
The man of average build should choose a rod which has a tip six or seven feet in length and between 12 and 14 ounces in weight. The butt of the surf rod has twin grips 21 to 26 inches apart.

Surf reels which spool between 200 and 300 yards of 12-strand line are usually sufficient, except for giant sharks when 400 yards of 15 or 18-strand line is desirable.

For the smaller surf fish a gut leader, testing from 15 to 25 pounds, is used with two or three hooks and a three to six-ounce sinker tied to the end. No. 4 or smaller hooks are adequate, but for sharks a hook about No. 6/0 on a six-foot steel strand leader is best.

In casting the angler grips his rod with both hands, his left side toward the sea, his rod pointed shoreward. Sharply the left hand pulls downward, the right hand giving the final impetus which hurls sinker to sea.

Tips on USING Effective BAIT for TROUT



Several methods of using bait for trout are shown in the above drawings. Three or four BB shot sinkers are spaced three or four inches apart on the gut leader.

IN THE spring at the opening of the trout season the streams are usually high and muddy. The trout are not surface feeding, therefore artificial flies are of little value. Trout are hugging the bottom of the stream and the place to seek them is with bait played deep along the bottom.

Ninety per cent of the lures used in early spring trout fishing are angleworms. A gut leader about three feet long will do both for fly and bait fishing. For bait fishing space two or more shot, BB in size or larger, three or four inches apart on the leader.

A method of attaching the worm to the hook is shown in Fig. 1. It tends to make the hook weedless. The worm is hooked on as shown, after which the head of the worm is pressed onto the point of the hook. Two worms can be used as shown.

Two hooks are fifty per cent more effective than one. As shown in Fig. 2, a snelled hook is used with a second hook with a turned down eye being slipped over the snell. It is tied tightly to the first hook with silk thread. The worm is then hooked on, its collar being pressed over the small hook.

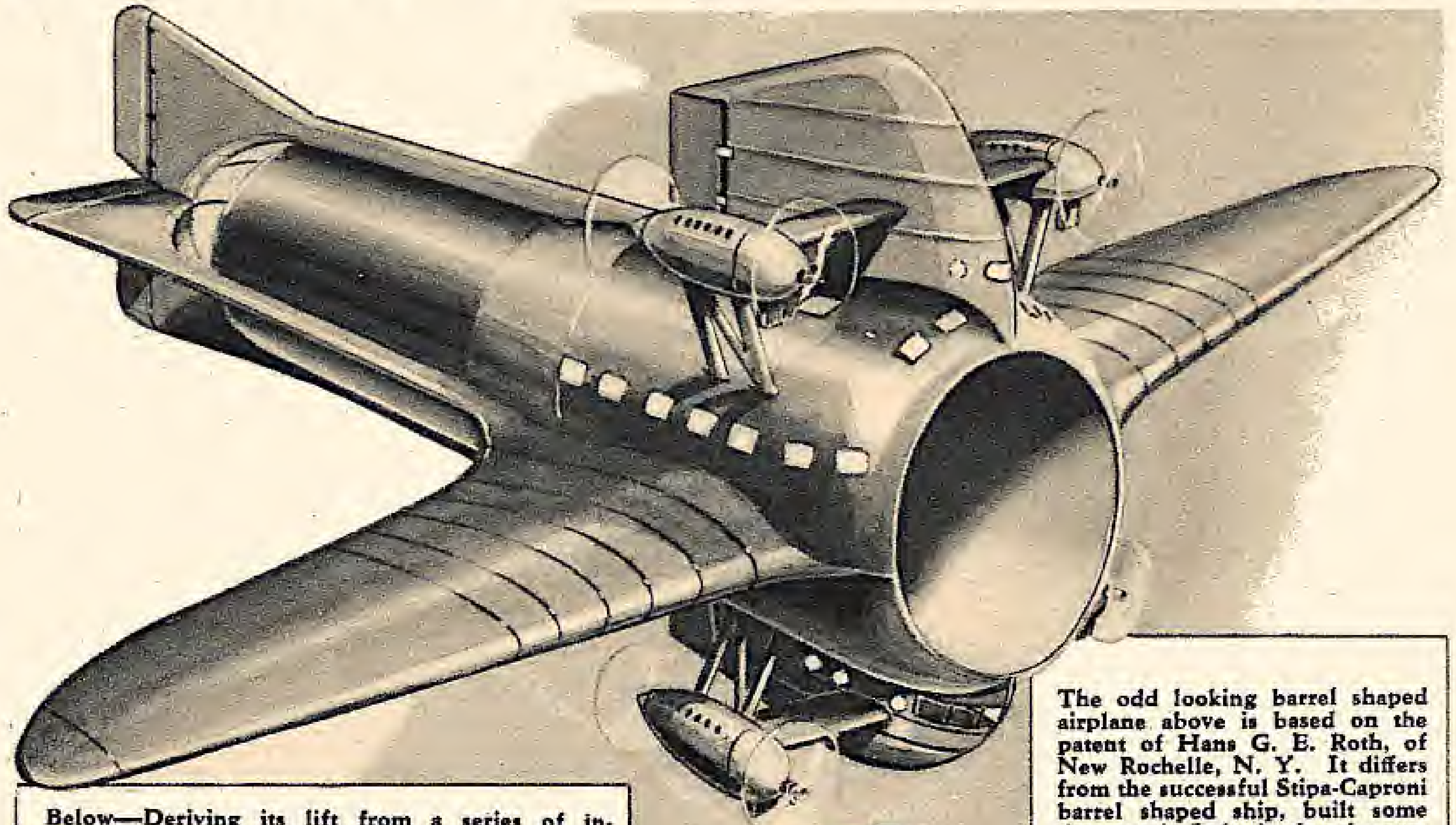
A spinner-on-shaft combination, either single as shown in Fig. 3 or tandem in Fig. 4, is especially effective in muddy water. The lure in Fig. 3 is the side of a shiner, which being limber will have an undulating motion in the water.

The lure in Fig. 4 is a minnow tail, cut with some of the tail section left on and hooked as shown. This is excellent lure for large rainbow and brown trout.

Inventors Patent Odd Designs FOR SAFER AIRPLANES

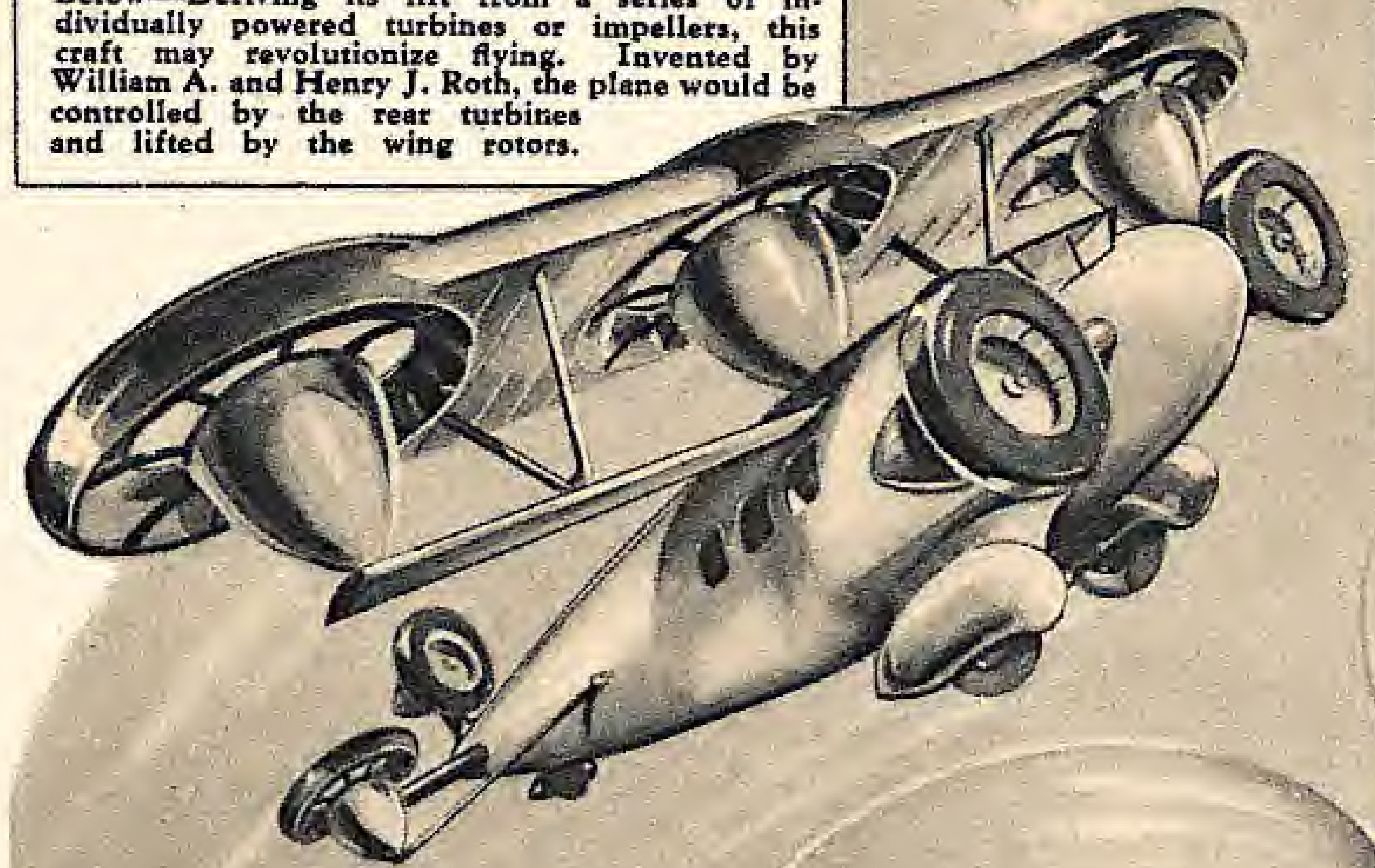
by DOUGLAS ROLFE

Unusual ships, straying away from accepted designs, are being tried in an effort to increase safety and simplify air travel. Some of the ideas are shown here.

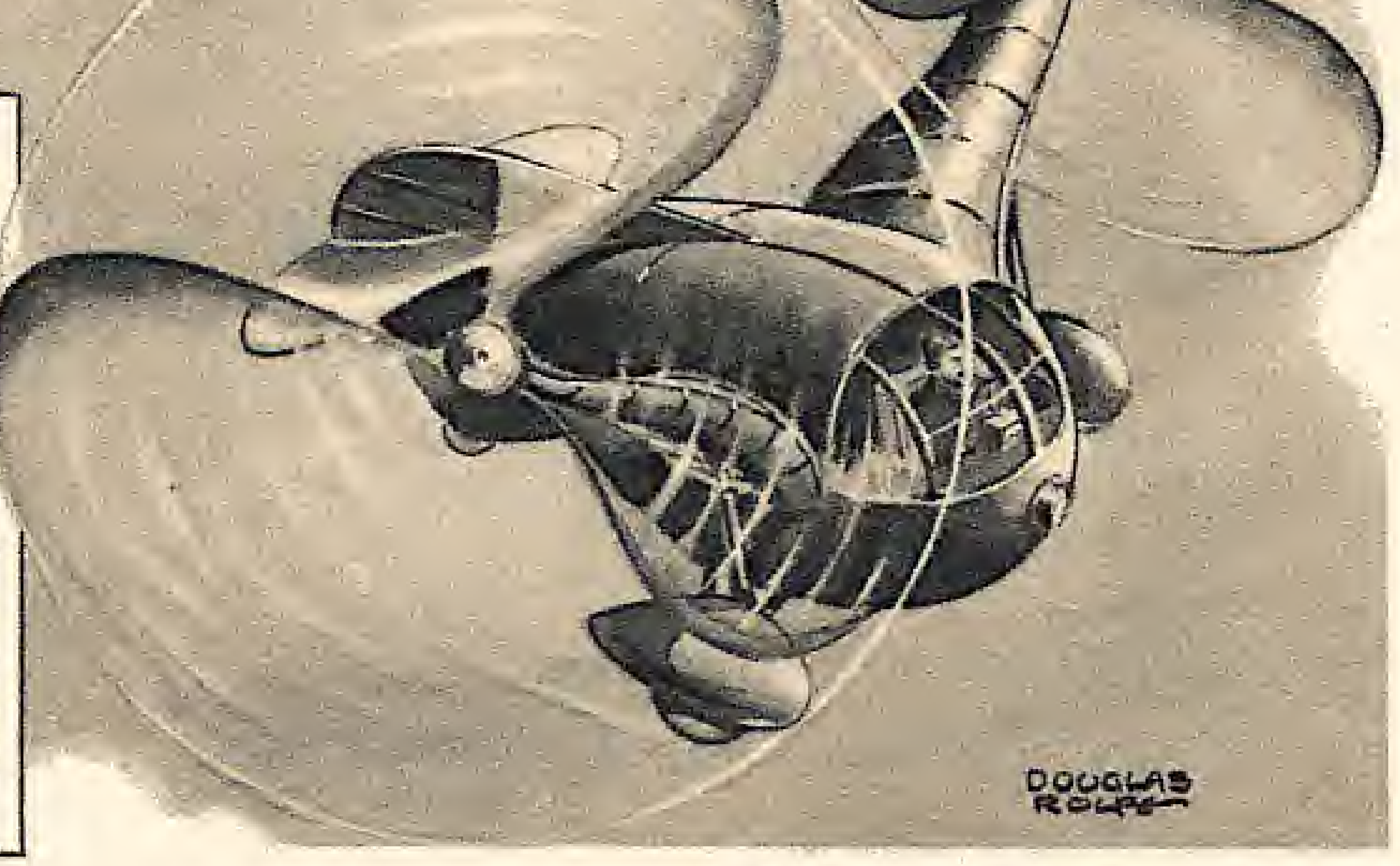


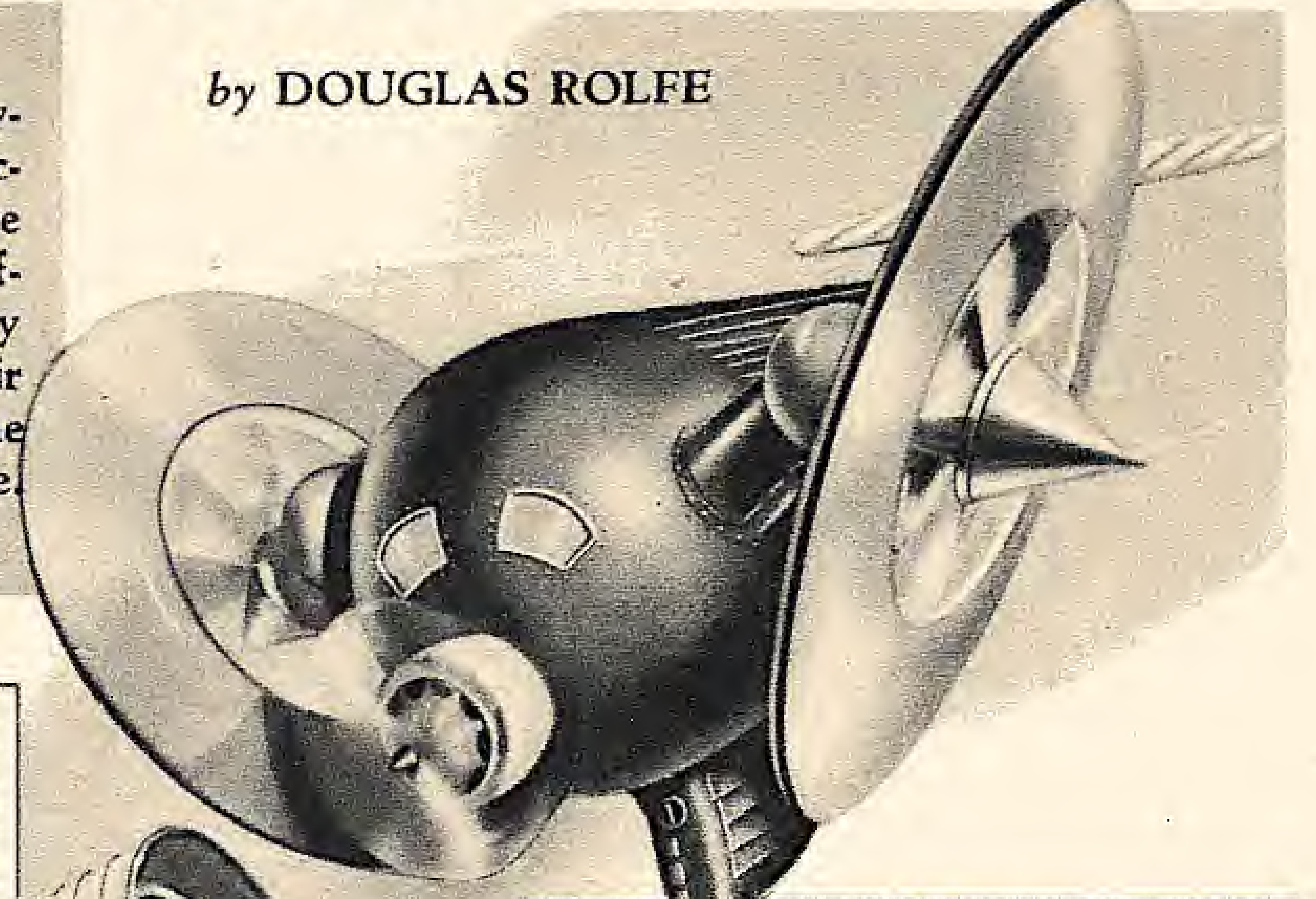
The odd looking barrel shaped airplane above is based on the patent of Hans G. E. Roth, of New Rochelle, N. Y. It differs from the successful Stipa-Caproni barrel shaped ship, built some time ago in Italy, in that the propellers are not mounted within the tunnel itself and in the curious arrangement of vertical fins above and below the main wing. These fins aid in lateral and directional control. Passenger accommodations would probably be located in the thickened portion of the barrel about the main wing, while the crew would be in the lower fin as shown above.

Below—Deriving its lift from a series of individually powered turbines or impellers, this craft may revolutionize flying. Invented by William A. and Henry J. Roth, the plane would be controlled by the rear turbines and lifted by the wing rotors.

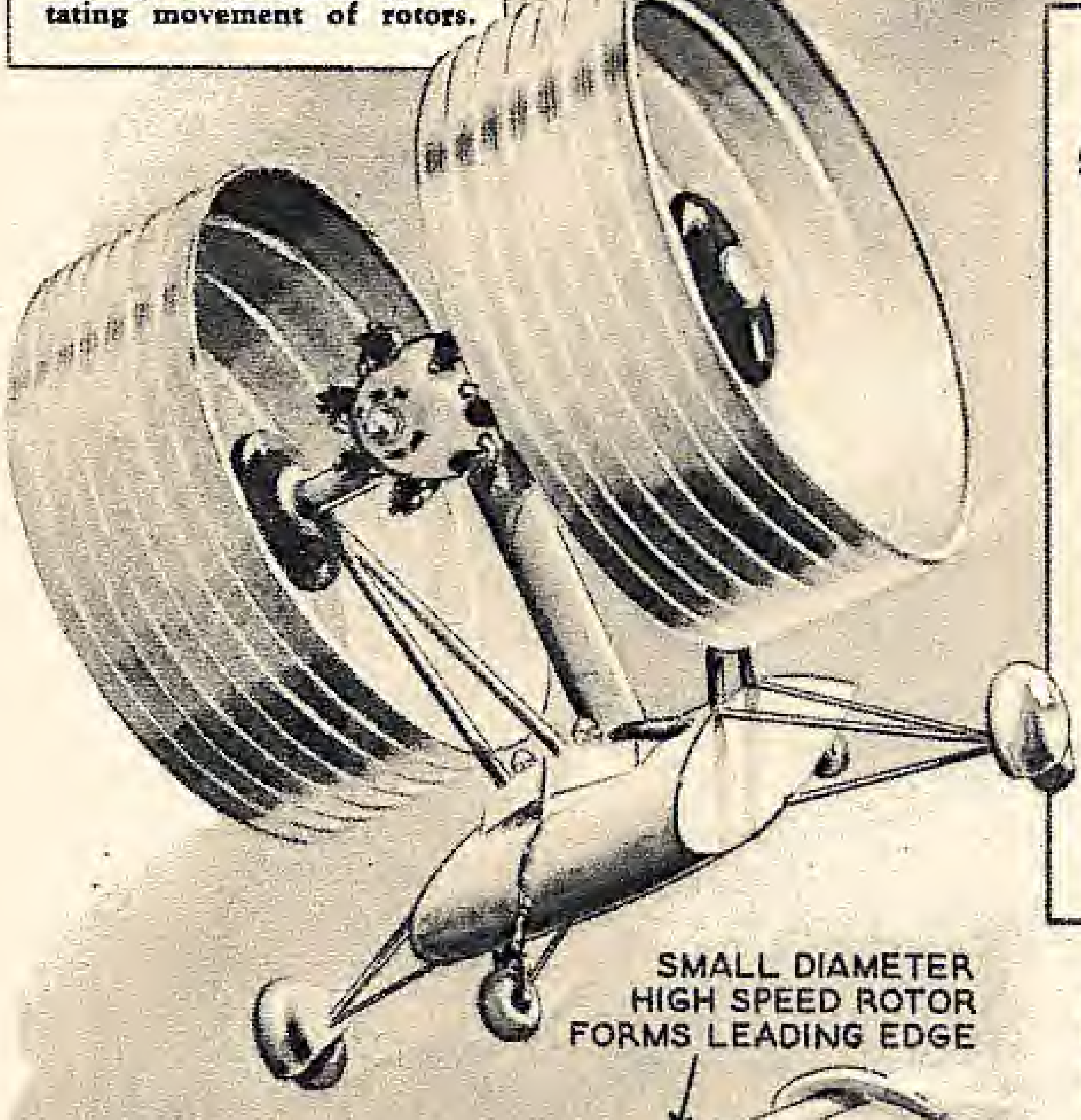


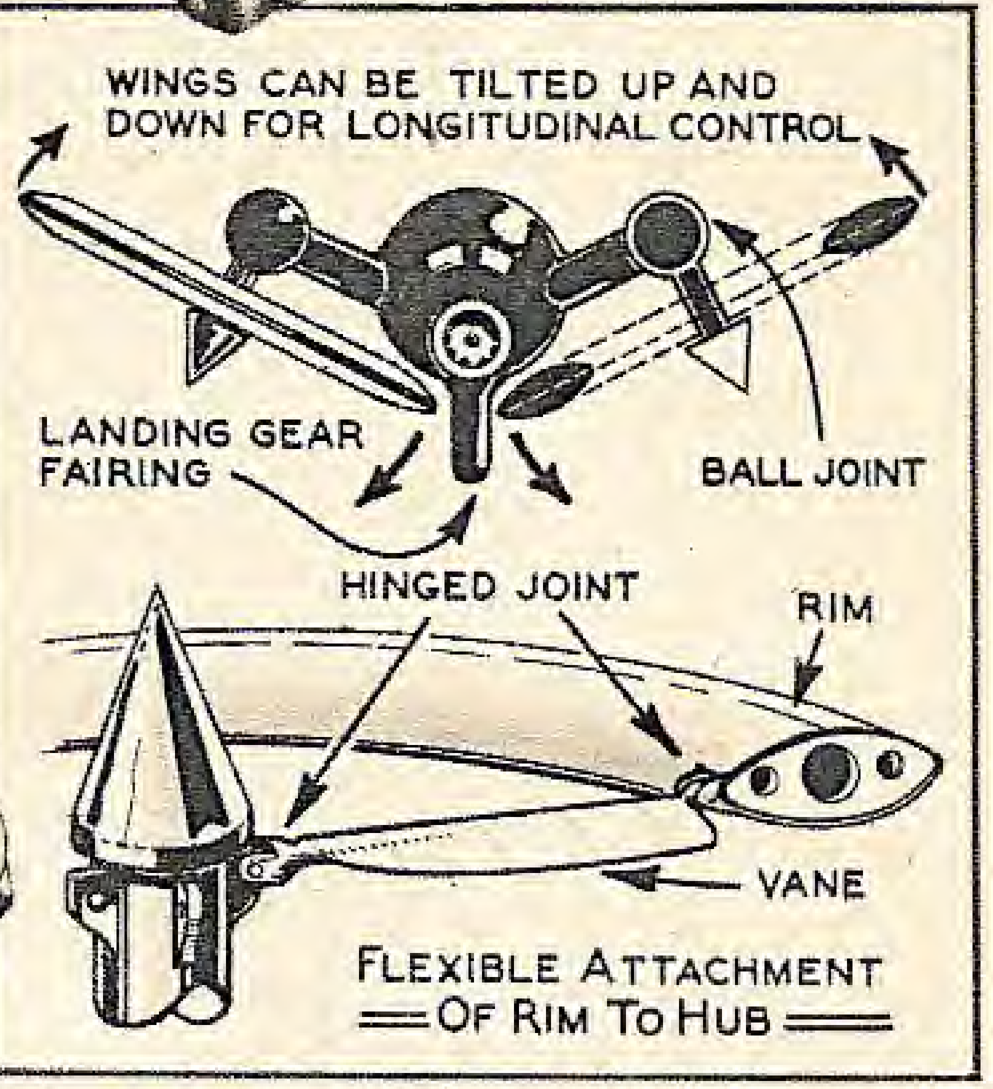
The flying machine at right was patented by Russell S. Powell, of Takoma Park, Md. It is an attempt to solve the problem of direct lift without the use of wings to support the ship in the air. The two 3-bladed propellers are intended to provide both lift and forward movement. They are set normally at angles so that the force of the screws are directed downward and to the rear. Such an airplane would not require wings to lift it. While ships of this general type have proved they are able to exert sufficient lift, a means of maintaining stability has yet to be discovered. This is the difficulty Cierva battled for years before finally meeting spectacular success with his Autogiro.



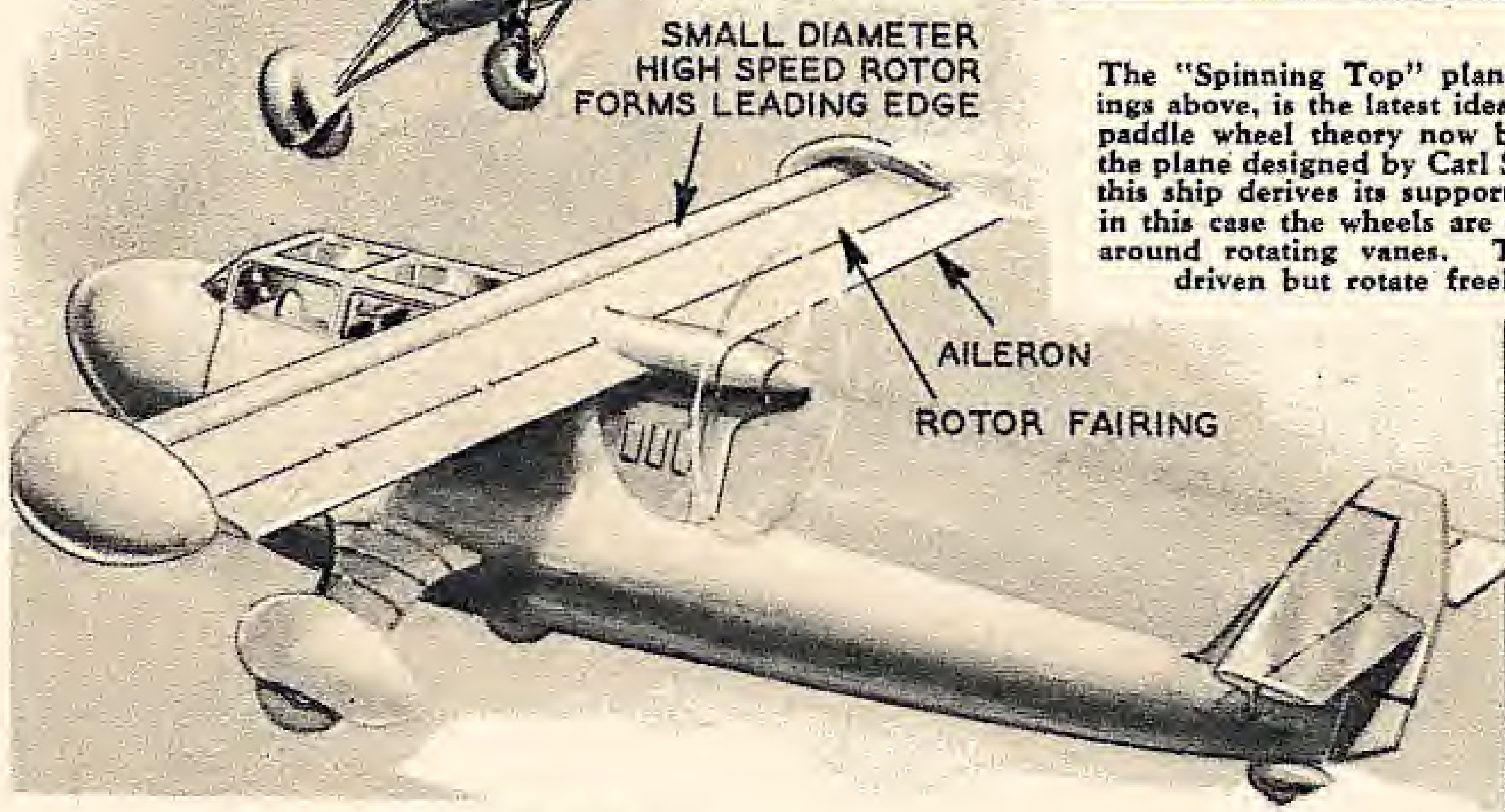


The remarkable "sidewheeler" below has actually undergone tests in France. The spinning rotors supplant usual wings. They both lift and propel the craft. Lateral stability is provided by rotating movement of rotors.




WINGS CAN BE TILTED UP AND DOWN FOR LONGITUDINAL CONTROL
LANDING GEAR FAIRING
BALL JOINT
HINGED JOINT
RIM
VANE
FLEXIBLE ATTACHMENT OF RIM TO HUB

The "Spinning Top" plane, illustrated in the drawings above, is the latest idea for the application of the paddle wheel theory now being tested abroad. Like the plane designed by Carl Strandgren (at left above), this ship derives its support from rotating wheels but in this case the wheels are composed of an outer rim around rotating vanes. The vanes are not power driven but rotate freely as in the autogiro.


SMALL DIAMETER HIGH SPEED ROTOR FORMS LEADING EDGE
AILERON
ROTOR FAIRING

The ship at left, designed by Alexander Chessin and Serge Trey, is intended to improve safe flying. A 12-inch hollow cylinder, 23 feet long forms the leading edge of the wing. Built on the Flettner rotor principle, it rotates 7,000 r.p.m. A constant stream of air is directed onto the cylinder by tiny jets to insure continuous lift.

Build this MOVIE STAR'S *Collapsible* TRAILER

by JACK SMALLEY

Here is the trim interior of Sir Guy Standing's trailer. On the sink at left is the portable water tank. Note folding table strapped to the roof. Pipes supporting roof and strengthening guy wires can be seen in rear.

Cheap, light, easy to build, this is the trailer you have been looking for. Its collapsible top and outslung bunks reduce traveling costs and increase camping comforts of motorists.

PART I

NOMADS of the open road will hail with delight this trailer with the one-man collapsible top and the hanging bunks. It has everything! Designed and originated by Sir Guy Standing, movie star, it was built by California's leading auto trailer expert, Harry Brumpton of Los Angeles. It is so simple that the average man can build it. It is so light that it can go anywhere, yet it will stand up under severe usage.

The top lowers onto the bottom body by the simple expedient of fastening the roof frame to pipes, which slide down into larger pipes set in the body. To raise, merely lift the top, insert plugs, and the top is rigid, waterproof, and cool. Slack in canvas is taken up by merely adjusting the sliding pipes. In traveling, the top lowers onto the body, is fastened down with auto curtain fasteners, and you're ready to ramble.

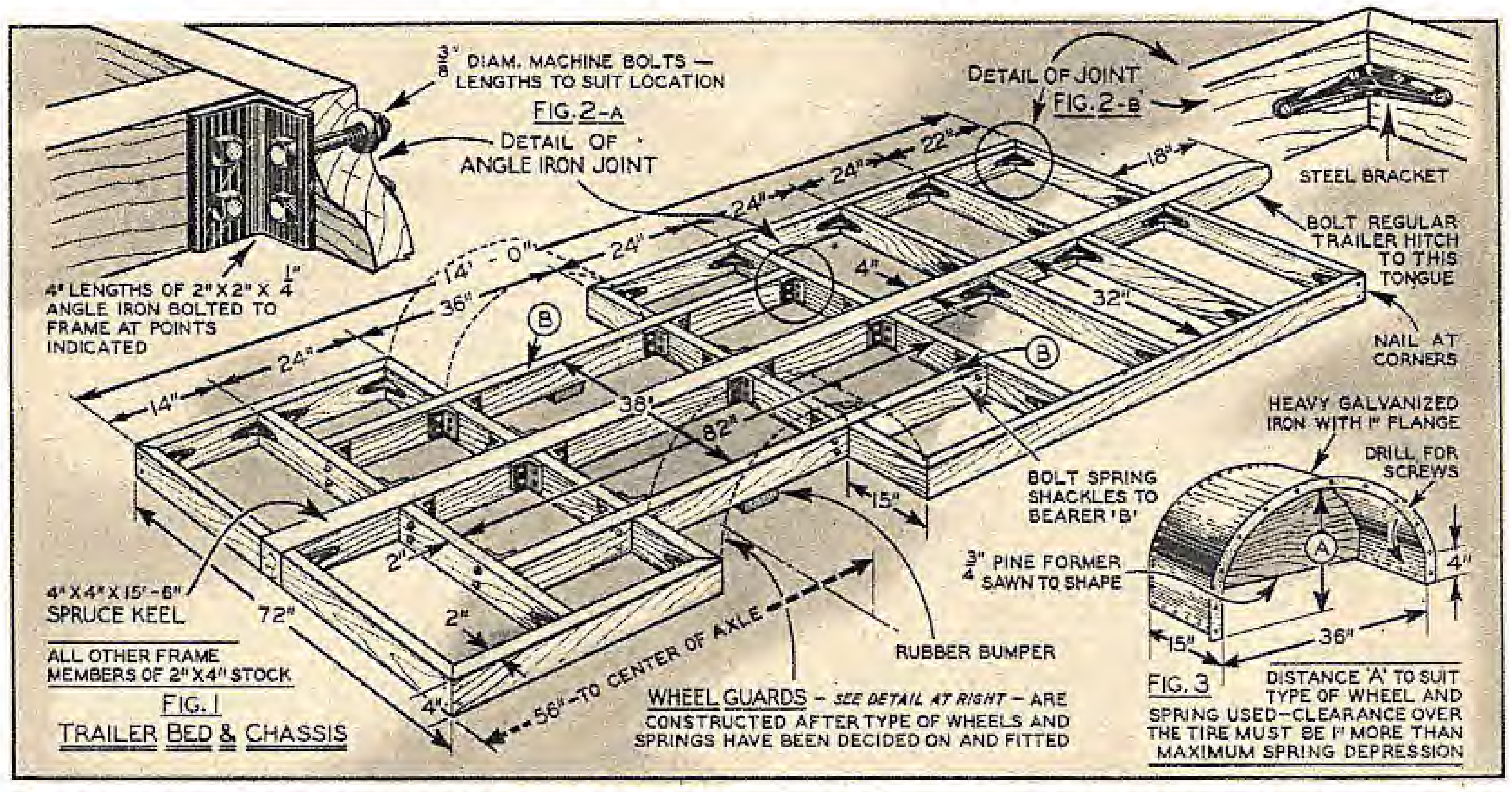
The body frame is covered with pressed wood, which is durable and eliminates "road rumble." The windows of the trailer are celluloid squares buttoned against mosquito netting, and in addition a skylight provides illumination. By hanging the bunks outside, maximum floor space is obtained and extra ventilation afforded. Those are highlights of the trailer; now to roll up our sleeves and make it.

First take a selected 4x4 spruce, 15½′ long, for the keel. This projects 1½′ and provides the tongue, on which you later fasten a regulation trailer hitch.

A 2″x4″ frame is then constructed and attached to the keel to form the trailer bed or foundation which is 14 feet long by 6 feet wide. The keel and frame members are braced as shown in Fig. 1 by means of pieces of angle iron and steel brackets.

By studying Fig. 1 it will be seen that the angle iron braces are used only to strengthen the truss about the spring bearers. Fig 2A shows a typical joint. All remaining joints are strengthened with steel brackets (Fig. 2B). With the diagonally laid flooring in place, as shown in Fig. 4, this construction will be found sufficiently strong and rigid to carry any running gear.

Now is the time to decide upon the wheels and springs you intend to employ. Measurements and details of the running gear are omitted since everyone has his own ideas on the subject and in any case the fittings will depend upon the type of wheels and springs


3/8" DIAM. MACHINE BOLTS — LENGTHS TO SUIT LOCATION
FIG. 2-A
DETAIL OF ANGLE IRON JOINT
4" LENGTHS OF 2"X2"X 1/4" ANGLE IRON BOLTED TO FRAME AT POINTS INDICATED
14' - 0"
36"
24"
24"
24"
24"
22"
18"
14"
38"
82"
4"
32"
B
B
2"
2"
72"
4"
15"
4"X4"X15'-6" SPRUCE KEEL
ALL OTHER FRAME MEMBERS OF 2"X4" STOCK
FIG. I
TRAILER BED & CHASSIS
56"—TO CENTER OF AXLE
WHEEL GUARDS – SEE DETAIL AT RIGHT – ARE CONSTRUCTED AFTER TYPE OF WHEELS AND SPRINGS HAVE BEEN DECIDED ON AND FITTED
DETAIL OF JOINT
FIG. 2-B
STEEL BRACKET
BOLT REGULAR TRAILER HITCH TO THIS TONGUE
NAIL AT CORNERS
BOLT SPRING SHACKLES TO BEARER 'B'
RUBBER BUMPER
HEAVY GALVANIZED IRON WITH 1" FLANGE
DRILL FOR SCREWS
3/4" PINE FORMER SAWN TO SHAPE
A
4"
15"
36"
FIG. 3
DISTANCE 'A' TO SUIT TYPE OF WHEEL AND SPRING USED—CLEARANCE OVER THE TIRE MUST BE 1" MORE THAN MAXIMUM SPRING DEPRESSION

Complete details of the trailer foundation are shown above. Running gear available to the builder is attached to the bearers marked B. Flooring, laid diagonally over the frame, helps to strengthen it. Angle irons and brackets also brace it.

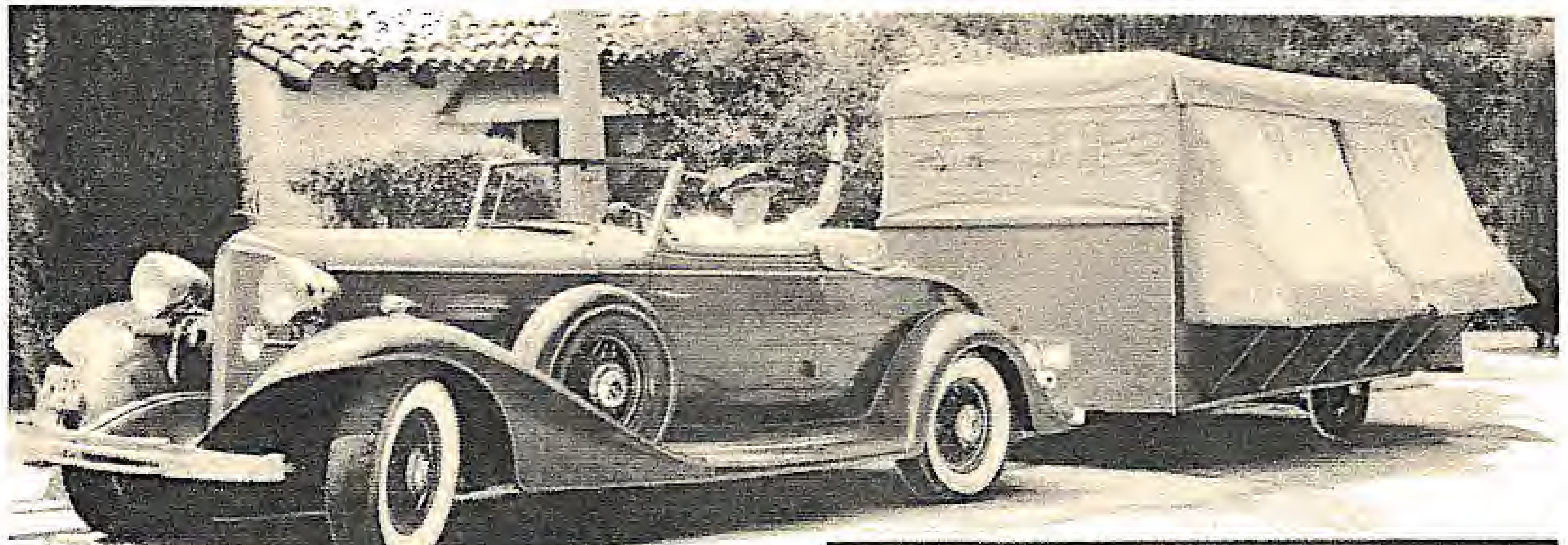
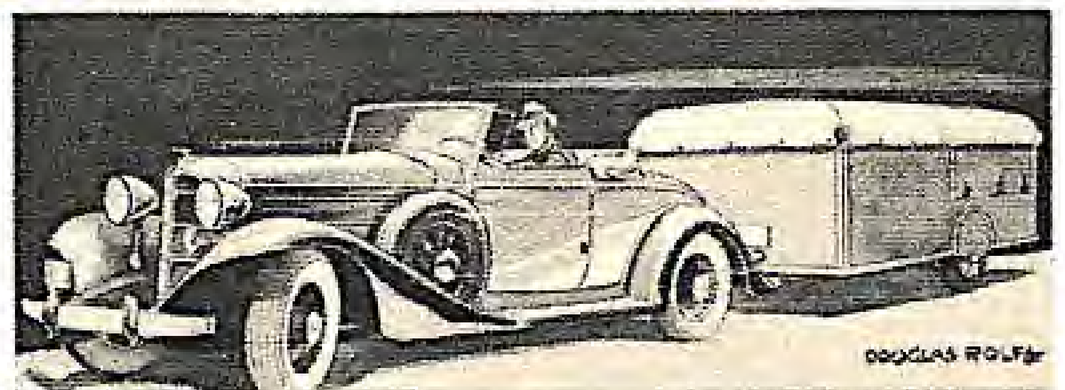
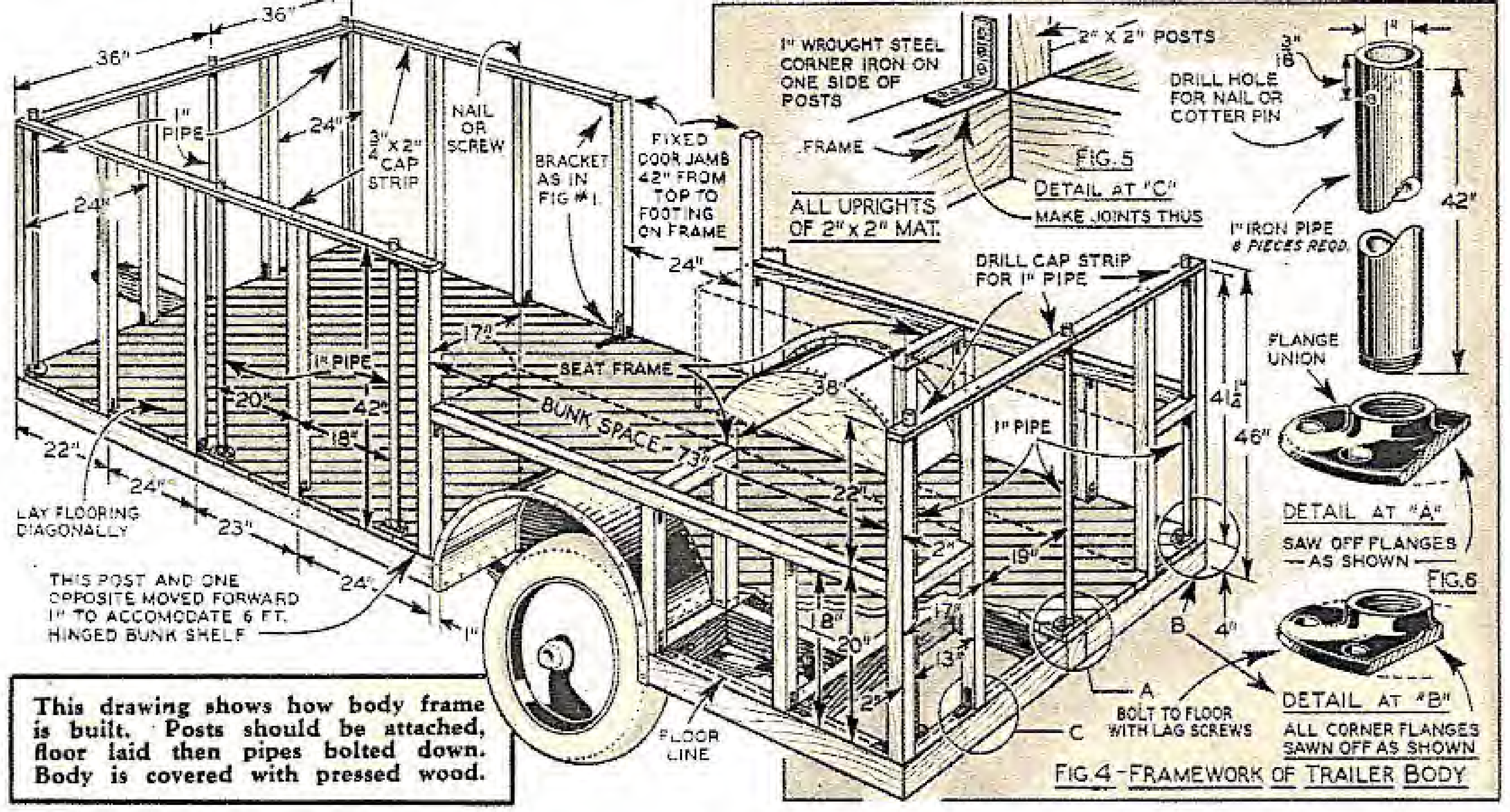


Photo above shows Sir Guy Standing, movie star, and trailer he designed. It shows the roof raised and bunks swung out. Trailer described here is modeled after Sir Guy Standing's trailer. Right—Drawing shows trailer with top down and bunk folded. This trailer has only one bunk on left side.

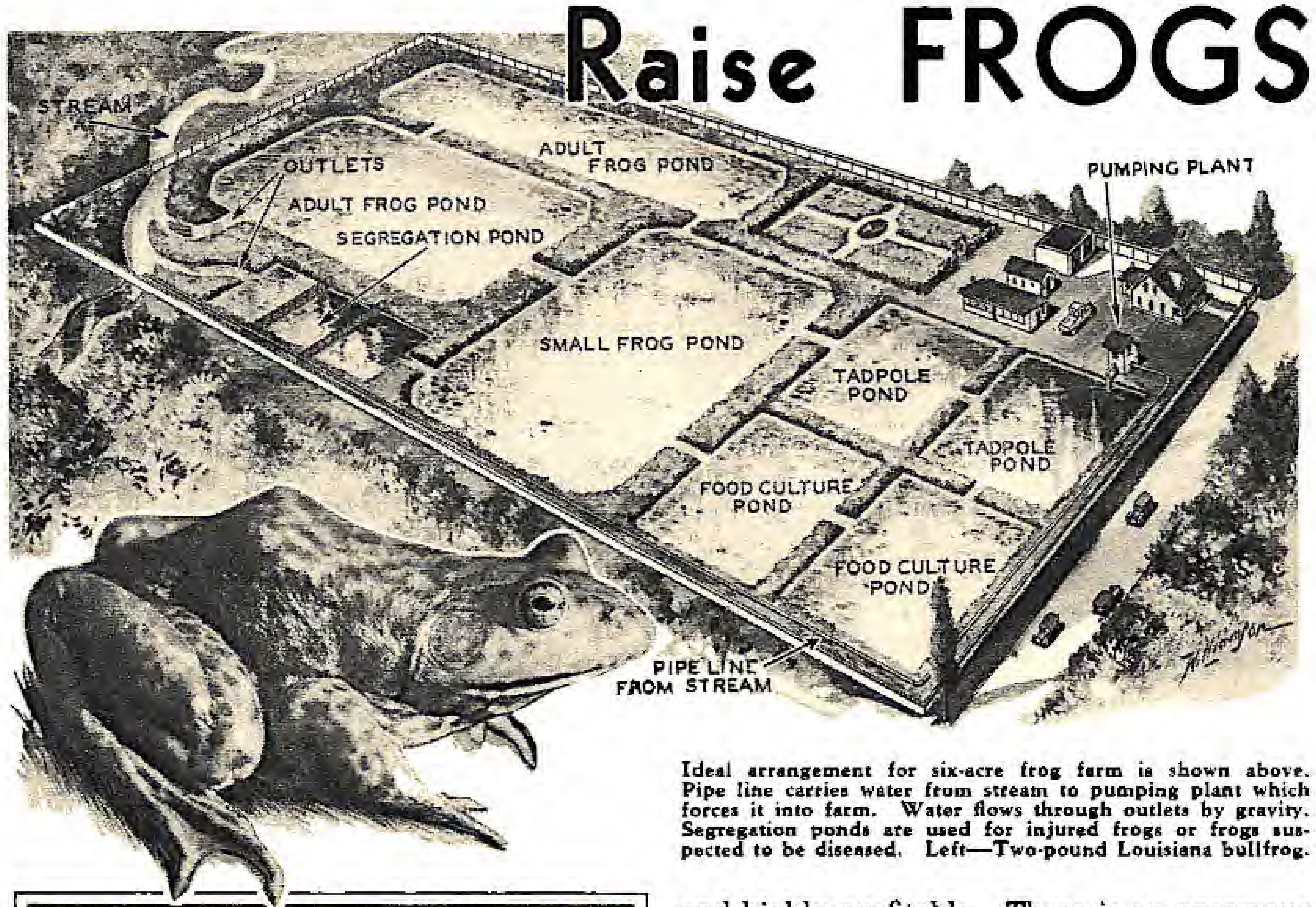

DOUGLAS ROLFE


36"
36"
24"
24"
1" PIPE
3/4"x2" CAP STRIP
NAIL OR SCREW
BRACKET AS IN FIG #1.
FIXED DOOR JAMB 42" FROM TOP TO FOOTING ON FRAME
24"
17½"
1" PIPE
SEAT FRAME
BUNK SPACE - 73"
20"
42"
18"
22"
24"
23"
24"
1"
LAY FLOORING DIAGONALLY
THIS POST AND ONE OPPOSITE MOVED FORWARD 1" TO ACCOMODATE 6 FT. HINGED BUNK SHELF
FLOOR LINE
1" WROUGHT STEEL CORNER IRON ON ONE SIDE OF POSTS
2" X 2" POSTS
FRAME
FIG. 5
DETAIL AT "C"
MAKE JOINTS THUS
ALL UPRIGHTS OF 2" x 2" MAT.
DRILL CAP STRIP FOR 1" PIPE
38"
1" PIPE
22½"
2"
19"
18"
20"
17½"
13"
2"
41¼"
46"
4"
B
A
C
BOLT TO FLOOR WITH LAG SCREWS
3/16"
1"
DRILL HOLE FOR NAIL OR COTTER PIN
42"
1" IRON PIPE 8 PIECES REQD.
FLANGE UNION
DETAIL AT "A"
SAW OFF FLANGES AS SHOWN
FIG. 6
DETAIL AT "B"
ALL CORNER FLANGES SAWN OFF AS SHOWN
FIG. 4 - FRAMEWORK OF TRAILER BODY

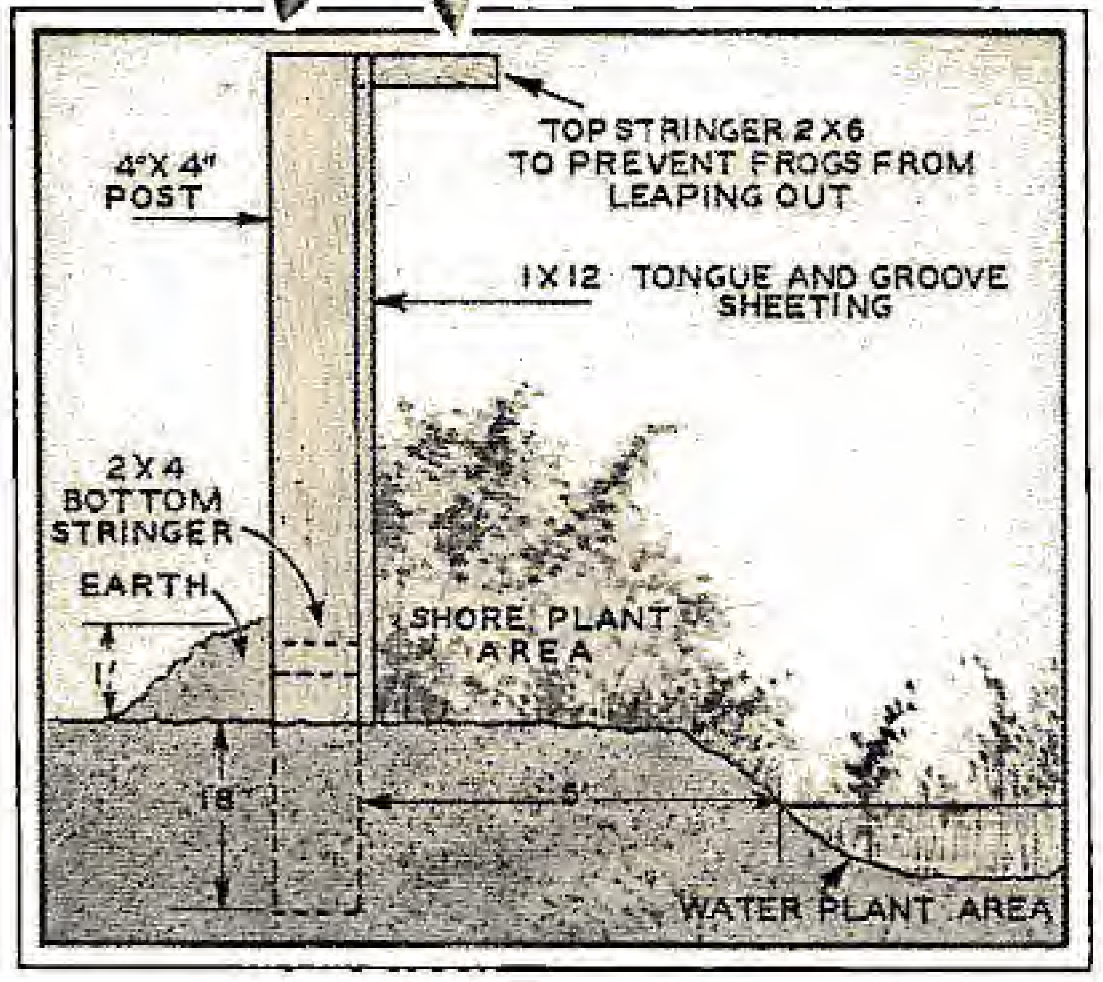
This drawing shows how body frame is built. Posts should be attached, floor laid then pipes bolted down. Body is covered with pressed wood.

Raise FROGS For Big PROFITS

by
JOHN EDWIN HOGG



Ideal arrangement for six-acre frog farm is shown above. Pipe line carries water from stream to pumping plant which forces it into farm. Water flows through outlets by gravity. Segregation ponds are used for injured frogs or frogs suspected to be diseased. Left—Two-pound Louisiana bullfrog.


TOP STRINGER 2X6 TO PREVENT FROGS FROM LEAPING OUT
4"X 4" POST
1X12 TONGUE AND GROOVE SHEETING
2X4 BOTTOM STRINGER
EARTH
SHORE PLANT AREA
18"
5'
WATER PLANT AREA

The best type of fence for frog farms is a solid wood structure built as shown above to prevent frogs from leaping out.

DURING the past 40 years numerous attempts have been made in nearly every state in the Union to produce bullfrogs as we raise other domestic livestock. The nation is dotted with so-called "frog farms," but upon investigation most of them are found to be experimental establishments with a very limited production.

There are, however, a number of frog farms in various states that have attained sufficient success to prove conclusively that the domestication of the bullfrog is feasible and highly profitable. There is an enormous market demand for frogs as a human food delicacy, for frog skins for the making of high grade leather, and for the manufacture of a powerful glue made from frog skins recently developed by French chemists. This vast market is being only partially supplied at present almost entirely from wild sources of supply. Intensive hunting is rapidly diminishing the wild frogs and it is only a question of time before this source of competition will be eliminated for the frog farmer. The bullfrog has already taken his place among the ranks of valuable domestic animals. Rich rewards will await those who can produce marketable frogs in commercial quantities.

There are numerous species of edible frogs in various parts of the United States but one is especially susceptible to domestication and large enough to be of market value. This is the Louisiana bullfrog, *Rana catesbiana*, a native of several southern states, which has been successfully acclimatized in many foreign countries and practically every state in the Union.

The bullfrog is an amphibious, shoreline creature. He is largely nocturnal in his habits. He is carnivorous and feeds entirely upon living food. Crayfish, top minnows, and insects, are his favorite titbits, but he will snap at any living organism he can swallow—including the tadpoles and young of his own kind. Throughout his entire life cycle he is beset by numerous natural enemies. He cannot stay out of water longer than his skin will remain wet. He cannot tolerate intense sunshine or dry heat without the immediate presence of shade and water. He is "cold blooded"—meaning that his blood temperature is always that of the air or water in which he lives. His physical energy increases with rising temperature and decreases with lowering temperature. Frogs are in danger if water temperatures rise above 100 degrees (F.) and both tadpoles and frogs go into a state of suspended animation (hibernation) when air and water temperatures go below 50 degrees. These biological facts must govern the principles of frog farming.

Bullfrogs can be raised in back yards, but a farm of six acres is a good size for a serious commercial venture. The maximum capacity of a well-managed, six-acre ranarium, as a frog farm is known, is probably not more than 10,000 adult frogs per year, even under the the intensive methods of culture practiced in Japan where frog farming has attained greater success than in any other country. Nevertheless, with marketable frogs bringing 25c to 50c each at present American wholesale prices, no other stock raising endeavor promises greater financial returns per acre.

Certain natural conditions must be present to render any piece of land a feasible site for a frog farm. The land must be fairly level. A cheap, abundant, and dependable water supply is imperative. Locations in river bottoms are liable to involve disastrous flood

This electrical bug catching machine gets bushels of insect food for frogs. Light attracts bugs. Whirling fan forces them into funnel-tube to the water.

This small frog farm in southern California has a woven wire fence with a horizontal top flange to keep frogs from leaping out. Note the luxuriant growth of vegetation which supplies food and shade and attracts insects which the frogs devour.

PITCH MARBLES To BATTER On BASEBALL GAME BOARD

by RALPH T. MOORE

This indoor version of the great American baseball game has all of the plays, all of the thrills of a World Series event, yet is really simple and inexpensive to construct in your workshop.

SKILL rather than luck determines the winner of a nine-inning baseball game played on this novel board. Each player, taking his turn at pitching, can deliver to the batter slow balls, fast ones, or even a curved ball. Both pitching cup and batting arm are controlled by pull-buttons at opposite sides of the board. A steel ball bearing ½-inch in diameter is the baseball.

One piece of plywood 19″x24″ is marked out for the playing board. With a 1″ drill make the ends of the slots, finishing with a key-hole saw. The corner slots are cut with the saw. File the edges of the slots slightly, then sand smooth. Drill ¼″ holes in the center of each base location, and three of the same size in the runners' dugout.

Paint the board a light green. When dry paint in the base and foul lines as shown, and outline all of the holes and slots in black.

Quarter-round moulding ¾″ on a side is now mitered and screwed to the board around all sides, the curved edges out, to form a fence which keeps the ball on the board.

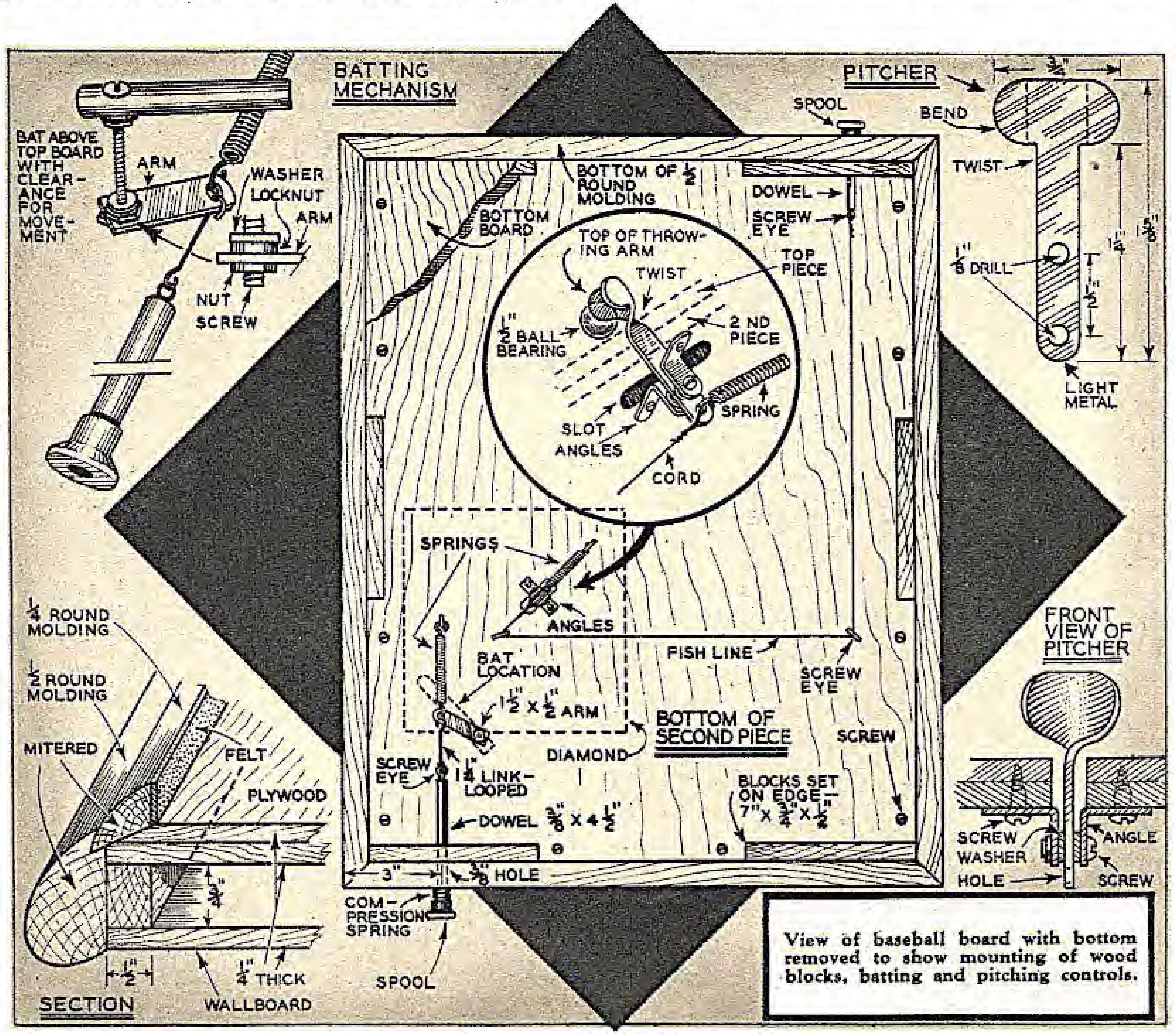
Place this playing field on another piece of plywood of the same size and drill holes as indicated in the sketches for the pitching arm and the batting arm. Paint the top of this board a dark green, as it will show through the holes in the playing board.

Fasten six 7″x¾″x½″ pine blocks to the bottom board by screws through the top, and screw 1½″ diameter half-round moulding to the blocks all around the board to form the sides. The plywood pieces are now fastened together with small screws around the edges. Nail a piece of wallboard to the blocks for a bottom covering.

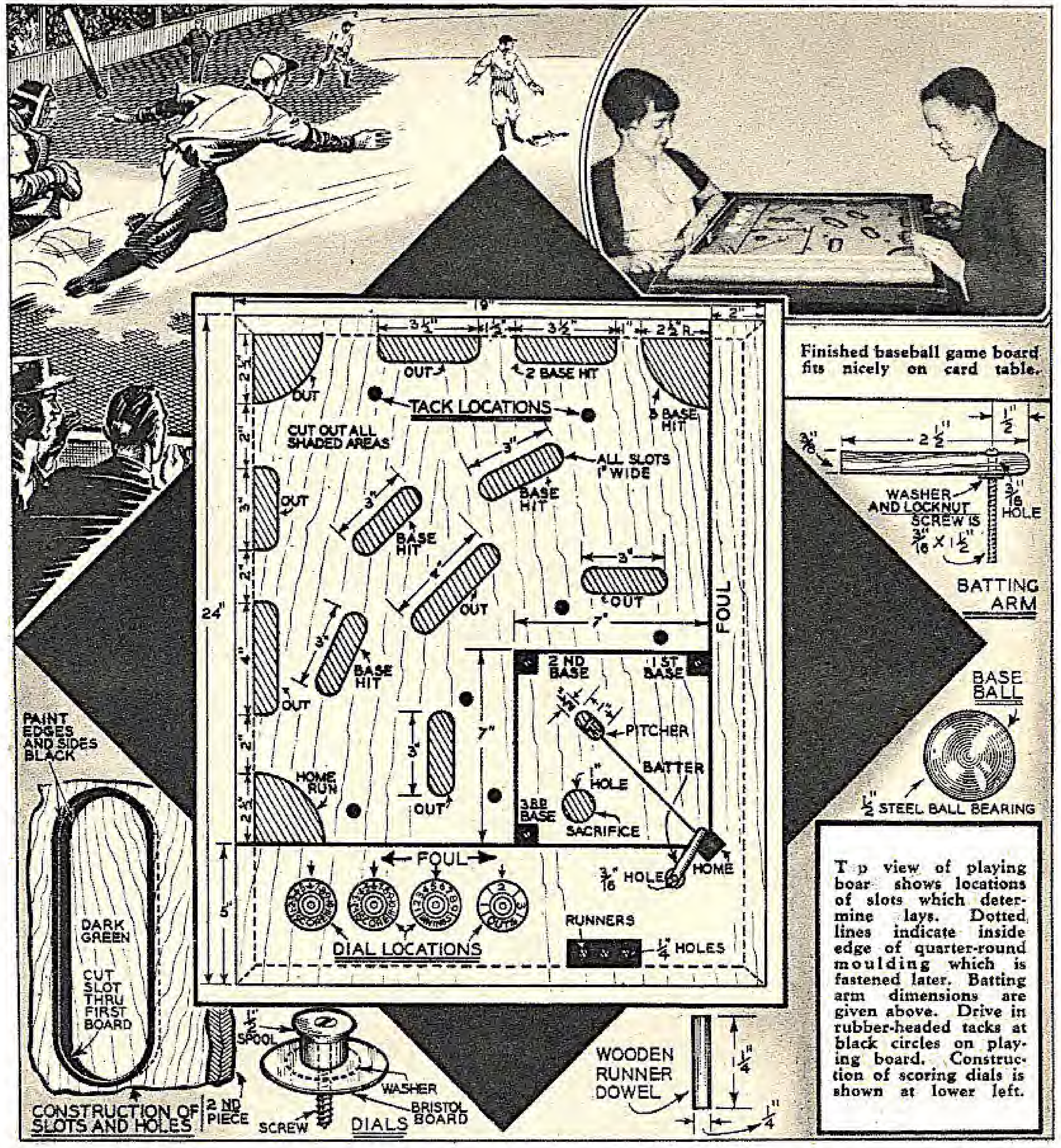
Regular baseball rules apply to this game whenever you are in doubt as to a play. Remember that a runner (peg) hit by a batted ball (ball bearing) is out. A ball driven over the fence and off the board is a foul ball. Batter is out if the ball hits the pitching arm. Pitched balls not crossing home plate are called balls—runner walks after four of these, as in regular baseball.

The game board is just the right size to fit on an ordinary card table. Players either change position after each inning, or turn the board around. The marking dials record the score, eliminating need for paper score pad and pencil.

Strikes and balls are called as play progresses, there being no need to keep a record of them. A score better than eight for nine innings is exceptional.


BATTING MECHANISM
BAT ABOVE TOP BOARD WITH CLEARANCE FOR MOVEMENT
ARM
WASHER
LOCKNUT
ARM
NUT
SCREW
BOTTOM BOARD
BOTTOM OF ½ ROUND MOLDING
TOP OF THROWING ARM
TWIST
½″ BALL BEARING
SLOT
ANGLES
2 ND PIECE
SPRING
CORD
TOP PIECE
DOWEL
SCREW EYE
SPOOL
PITCHER
BEND
TWIST
⅛″ DRILL
¾″
1¼″
1⅝″
½″
LIGHT METAL
SPRINGS
ANGLES
BAT LOCATION
1½″ x ½″ ARM
FISH LINE
SCREW EYE
DIAMOND
BOTTOM OF SECOND PIECE
SCREW
SCREW EYE
1¼ LINK-LOOPED
DOWEL ⅜″ x 4½″
BLOCKS SET ON EDGE—7″x ¾″x ½″
3″
⅜″ HOLE
COMPRESSION SPRING
SPOOL
FRONT VIEW OF PITCHER
SCREW
WASHER
HOLE
ANGLE
SCREW
¼ ROUND MOLDING
½ ROUND MOLDING
MITERED
FELT
PLYWOOD
¾″
½″
¼″ THICK
WALLBOARD
SECTION

View of baseball board with bottom removed to show mounting of wood blocks, batting and pitching controls.


19″
3½″
1½″
3½″
1″
2½″ R.
2″
OUT
OUT
2 BASE HIT
3 BASE HIT
TACK LOCATIONS
CUT OUT ALL SHADED AREAS
ALL SLOTS 1″ WIDE
3″
BASE HIT
OUT
BASE HIT
4″
OUT
3″
BASE HIT
OUT
3″
OUT
7″
FOUL
24″
2 ND BASE
1 ST BASE
PITCHER
BATTER
1″ HOLE
3RD BASE
SACRIFICE
HOME RUN
OUT
3″
7″
HOME
3/16″ HOLE
FOUL
5″
DIAL LOCATIONS
RUNNERS
¼″ HOLES
PAINT EDGES AND SIDES BLACK
DARK GREEN
CUT SLOT THRU FIRST BOARD
CONSTRUCTION OF SLOTS AND HOLES
2 ND PIECE
½″ SPOOL
WASHER
BRISTOL BOARD
SCREW
DIALS
WOODEN RUNNER DOWEL
1¼″
¼″
⅜″
2½″
½″
WASHER AND LOCKNUT
SCREW IS 3/16″ x 1½″
3/16″ HOLE
BATTING ARM
BASE BALL
½″ STEEL BALL BEARING

Finished baseball game board fits nicely on card table.

Top view of playing board shows locations of slots which determine plays. Dotted lines indicate inside edge of quarter-round moulding which is fastened later. Batting arm dimensions are given above. Drive in rubber-headed tacks at black circles on playing board. Construction of scoring dials is shown at lower left.

Completing Midget Miller—Model Dirt Track Racer

by WESTON FARMER

PART II

"MIDGET MILLER," scale model of the famous Miller dirt track racers, provides plenty of thrills at 20 miles an hour. It is just the thing for midget car racing and with its novel clutch system can be used in the heaviest traffic of city streets.

In Part I we completed the frame. This month we will complete the entire car.

The springing of "Midget Miller" is ingenious. It consists of two long leaves in front bolted with two 5/16" s. a. e. nickel steel bolts to the spring perch as shown in Fig. 3. Small top leaves can be put in to help the reflex springing, but they are not necessary.

The ends of these springs are bolted to the king pin landings, shown in detail in Fig. 6. The king pins shown in the photos were cast of bronze and the stub shafts themselves were therefore bronze, eliminating the necessity of bronze bushings in the front wheels. Fig. 6, however, shows a method of building up the king pin assembly.

A small block of metal 1¼" high, 2" wide has welded to its end a piece of one inch cold rolled shafting 3" long to receive the king pin. A small gusset (triangular) plate is welded between the solid spring landing and the king pin shafting to strengthen the assembly. The king pin shaft is bored for the ¼" nickel steel king pin bolt.

The spindle assembly is bent from 3/16" strap as shown and drilled for the bolt. Then the stub shaft can be centered through a hole drilled for it and welded or brazed in. The wheels must be fitted with bronze bushings. Each wheel should be locked on with a double lock nut and the shaft threaded so that the nut tends to tighten in the direction of wheel rotation.

Drawing below shows entire assembly of the Midget Miller. The front spring arrangement shown gives the car semi-independent suspension that assures a smooth ride. Those wishing to avoid building up the front spring perch and king pin assembly can use a solid front axle and knucklet. Springs mounted in same way as on rear axle must be used with perches on side frames.

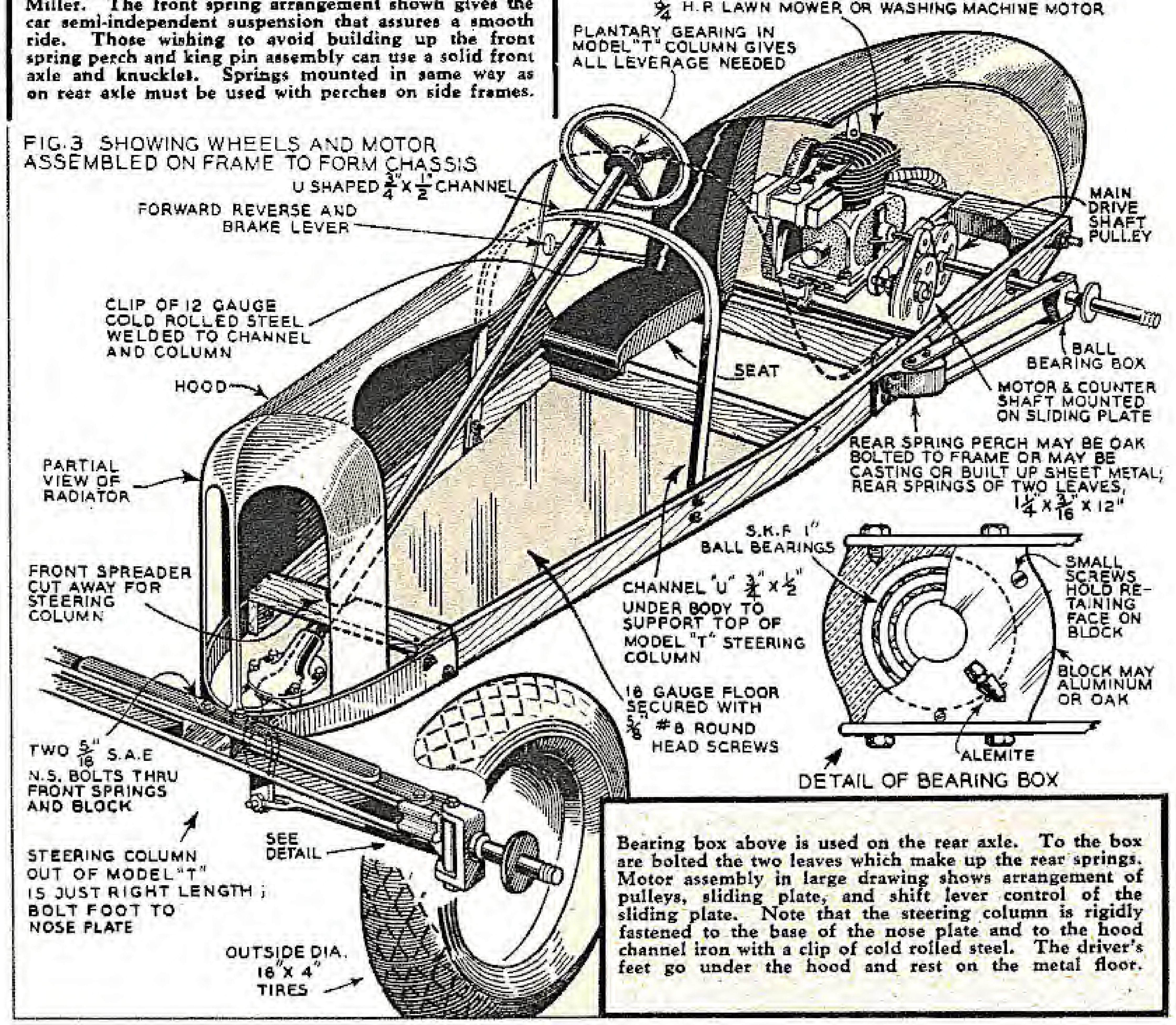
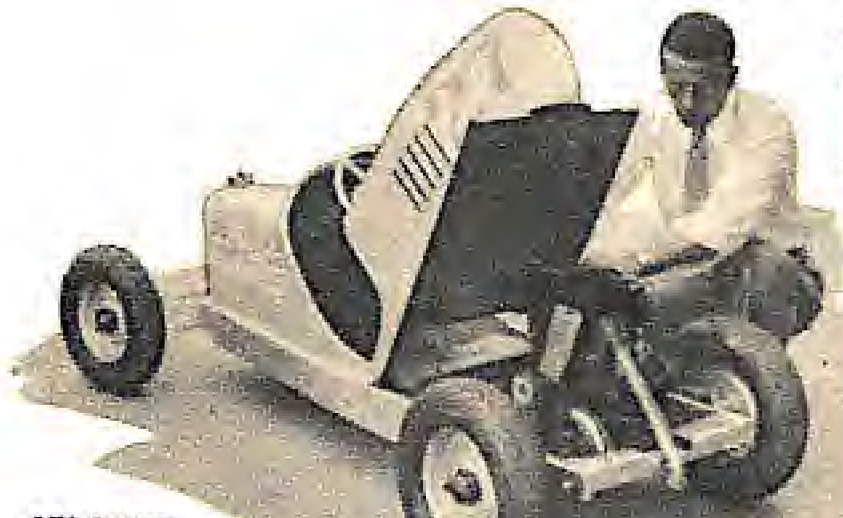


FIG. 3 SHOWING WHEELS AND MOTOR ASSEMBLED ON FRAME TO FORM CHASSIS

3/4 H.P. LAWN MOWER OR WASHING MACHINE MOTOR
PLANTARY GEARING IN MODEL "T" COLUMN GIVES ALL LEVERAGE NEEDED
U SHAPED 3/4" X 1/2" CHANNEL
FORWARD REVERSE AND BRAKE LEVER
CLIP OF 12 GAUGE COLD ROLLED STEEL WELDED TO CHANNEL AND COLUMN
HOOD
MAIN DRIVE SHAFT PULLEY
SEAT
BALL BEARING BOX
MOTOR & COUNTER SHAFT MOUNTED ON SLIDING PLATE
REAR SPRING PERCH MAY BE OAK BOLTED TO FRAME OR MAY BE CASTING OR BUILT UP SHEET METAL; REAR SPRINGS OF TWO LEAVES, 1¼" X 3/16" X 12"
PARTIAL VIEW OF RADIATOR
S.K.F 1" BALL BEARINGS
SMALL SCREWS HOLD RETAINING FACE ON BLOCK
FRONT SPREADER CUT AWAY FOR STEERING COLUMN
CHANNEL "U" 3/4" X 1/2" UNDER BODY TO SUPPORT TOP OF MODEL "T" STEERING COLUMN
BLOCK MAY ALUMINUM OR OAK
18 GAUGE FLOOR SECURED WITH 5/8" #8 ROUND HEAD SCREWS
ALEMITE
TWO 5/16" S.A.E N.S. BOLTS THRU FRONT SPRINGS AND BLOCK
SEE DETAIL
STEERING COLUMN OUT OF MODEL "T" IS JUST RIGHT LENGTH; BOLT FOOT TO NOSE PLATE
OUTSIDE DIA. 16" X 4" TIRES

DETAIL OF BEARING BOX

Bearing box above is used on the rear axle. To the box are bolted the two leaves which make up the rear springs. Motor assembly in large drawing shows arrangement of pulleys, sliding plate, and shift lever control of the sliding plate. Note that the steering column is rigidly fastened to the base of the nose plate and to the hood channel iron with a clip of cold rolled steel. The driver's feet go under the hood and rest on the metal floor.



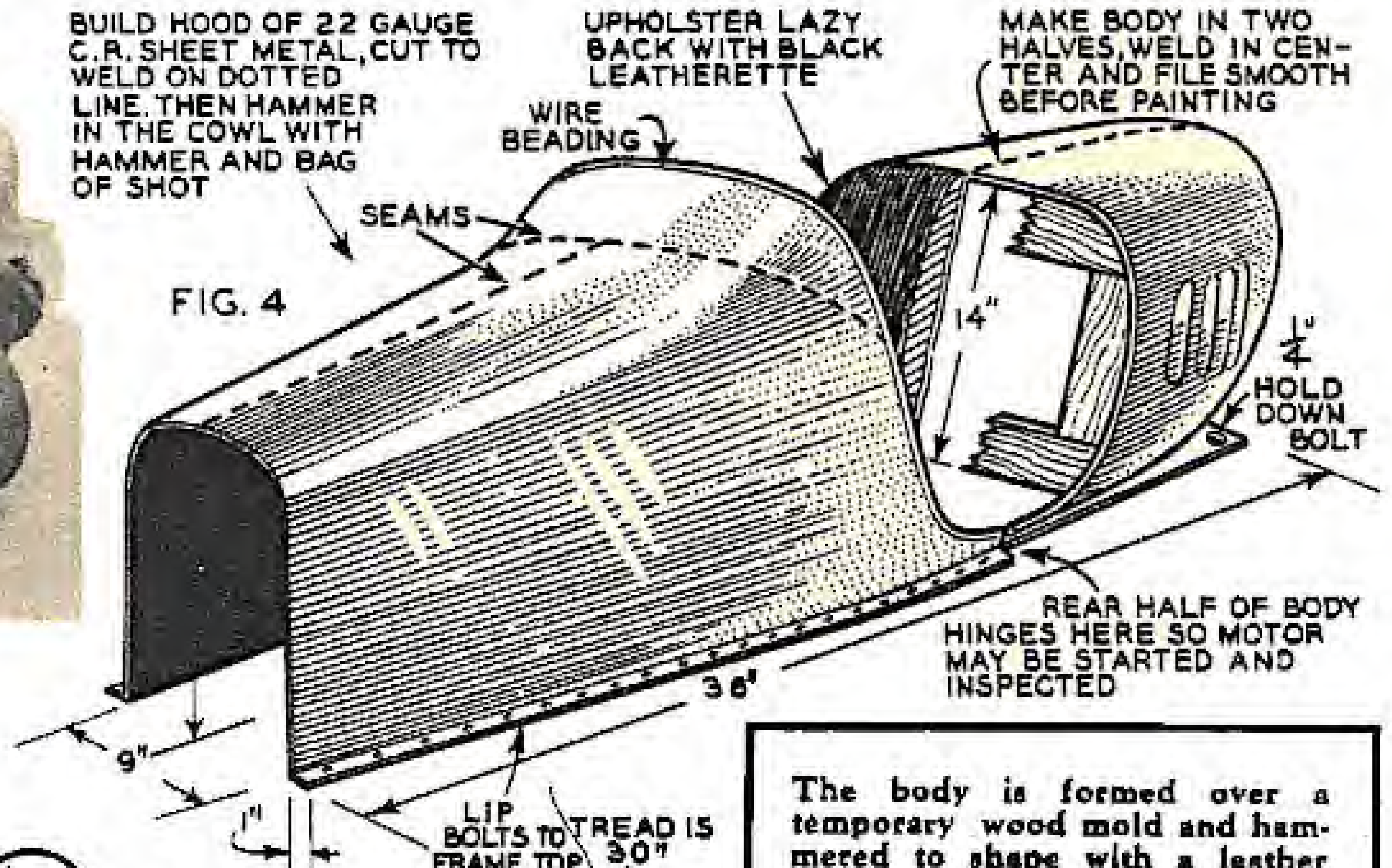


FIG. 4

BUILD HOOD OF 22 GAUGE C.R. SHEET METAL, CUT TO WELD ON DOTTED LINE. THEN HAMMER IN THE COWL WITH HAMMER AND BAG OF SHOT
UPHOLSTER LAZY BACK WITH BLACK LEATHERETTE
MAKE BODY IN TWO HALVES, WELD IN CENTER AND FILE SMOOTH BEFORE PAINTING
WIRE BEADING
SEAMS
14"
1/4"
HOLD DOWN BOLT
REAR HALF OF BODY HINGES HERE SO MOTOR MAY BE STARTED AND INSPECTED
36"
9"
1"
LIP BOLTS TO FRAME TOP
TREAD IS 30"
30"

The body is formed over a temporary wood mold and hammered to shape with a leather faced hammer. Seams shown are welded since vibration will crack solder. Rear half hinges.

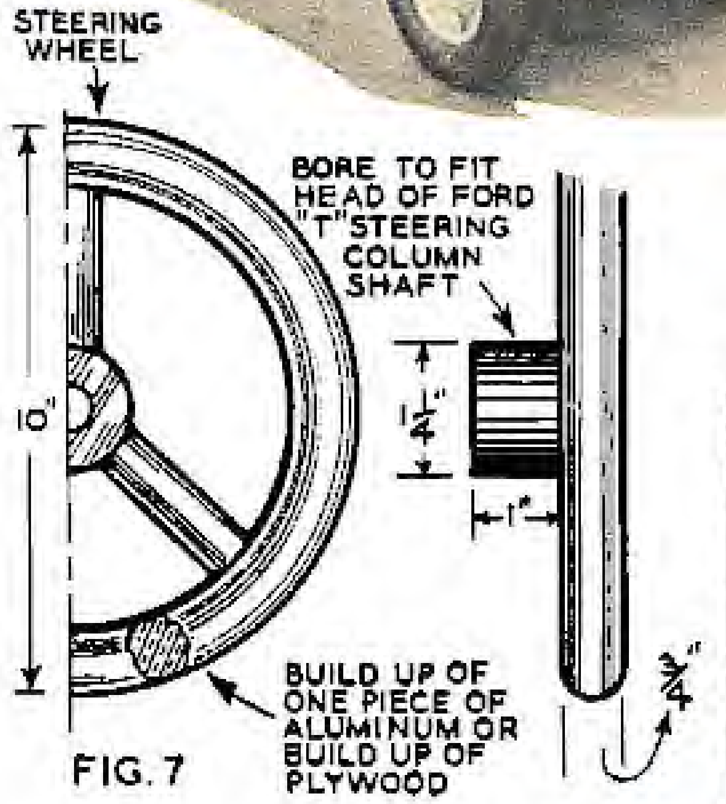


FIG. 7

STEERING WHEEL
BORE TO FIT HEAD OF FORD "T" STEERING COLUMN SHAFT
10"
1¼"
1"
3/4"
BUILD UP OF ONE PIECE OF ALUMINUM OR BUILD UP OF PLYWOOD

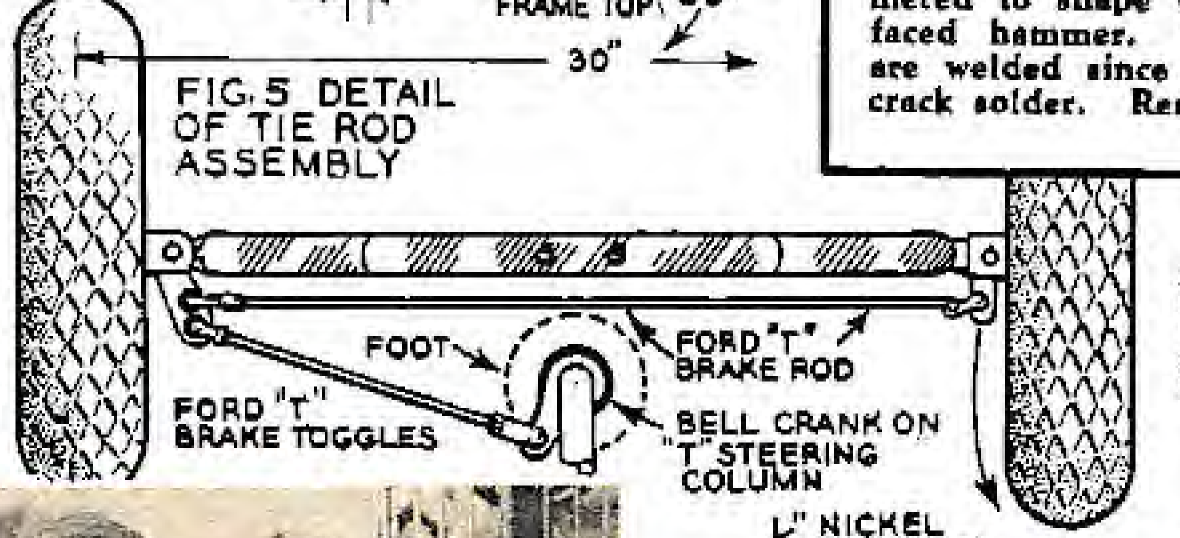
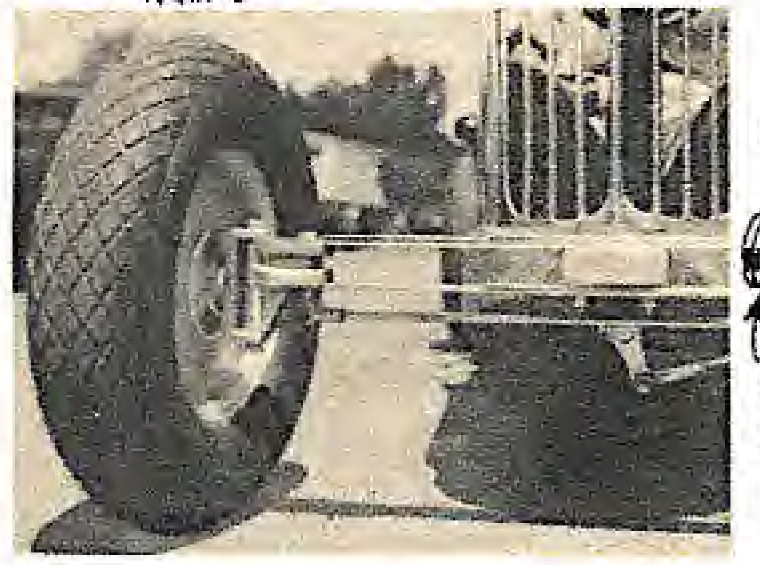


FIG. 5 DETAIL OF TIE ROD ASSEMBLY

FOOT
FORD "T" BRAKE ROD
FORD "T" BRAKE TOGGLES
BELL CRANK ON "T" STEERING COLUMN

Photo at top shows how rear half of body can be lifted to inspect motor, while photo at right is a closeup of the front spring perch and king pin detail. Ford T steering wheel can be used or a three-spoke wheel cast of aluminum or built up of plywood as shown in Fig. 7. Fig. 5 shows the front assembly. In building the left hand king pin, Fig. 6, make the extension arm 5" long to hold tie and connecting rods.



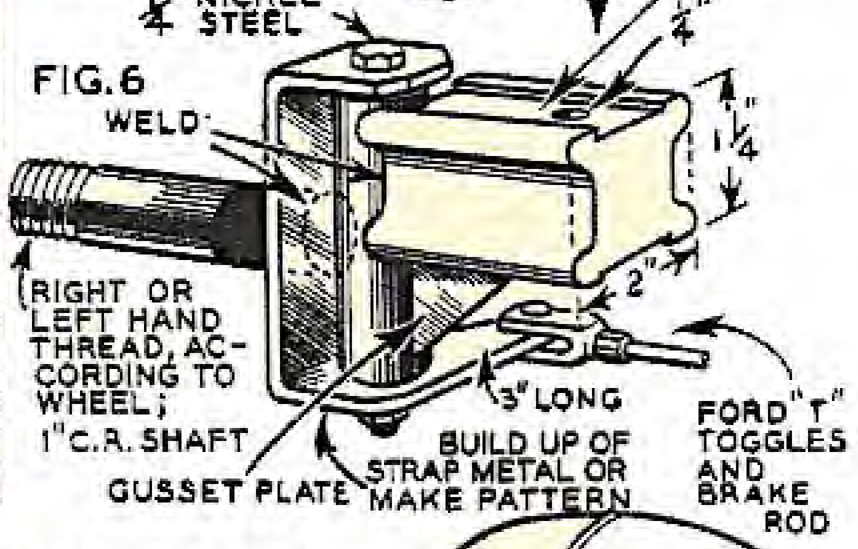


FIG. 6

SPRING LANDING MAY BE CAST OR MACHINED FROM SOLID AS PER DOTTED LINE
GROOVE FOR SPRING
1/4" NICKEL STEEL
1/4"
WELD
1¼"
2"
RIGHT OR LEFT HAND THREAD, ACCORDING TO WHEEL; 1" C.R. SHAFT
3" LONG
FORD "T" TOGGLES AND BRAKE ROD
BUILD UP OF STRAP METAL OR MAKE PATTERN
GUSSET PLATE

The radiator shell at right is built up of two halves of 22 gauge c.r. sheet metal. Brass bars are soldered on to form the grid. The entire shell can be nickel plated. In king pin assembly, Fig. 6, the spring landing can be left square or machined. The assembly shown is for the right hand wheel. Model T toggles and brake rods are used for the tie rod assembly as shown in Fig. 5 above.

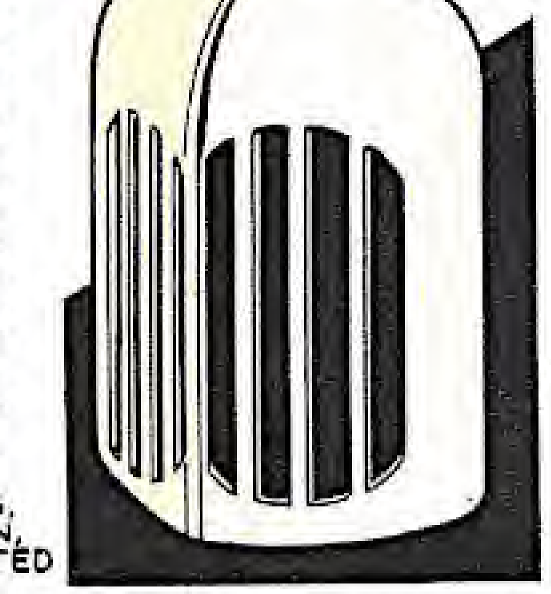


FIG. 8

BRASS BARS, SOLDERED IN, NICKEL PLATED

The tie rods are Ford Model T brake rods and brake rod toggles to make a connection between the bell crank at the end of the steering column and the king pins. See Fig. 5.

The rear wheels are a simple assembly. A double V pulley 8" in diameter (Fig. 9) is placed on the rear axle after it is threaded through one of the axle holes in the frame. The pulley is locked in place with set screws.

The rear springs are 1¼"x3/16"x12" spring steel. They are led from the spring perch at the side of the frame, which may be a wood block of oak or a cast perch. Two 5/16" bolts through the block will hold the springs to the car frame securely. The rear ends are mounted on a block which holds the 1" s. k. f. ball bearings. These blocks (Fig. 3) are either of oak or may be aluminum blocks machined out. Their function is to anchor the springs and hold the ball bearings through which the shaft runs. It is wise too, to

EX LIBRIS
Anonymous
Malefactor
MUSIQUE AND SWEET POETRIE AGREE
AS THEY MUST NEEDES
DATE
H. Ospovat 98